CHALMERS
UNIVERSITY OF TECHNOLOGY

# Resource Based View in a Swedish Railway Maintenance Project

## Assessing the Intangible Aspects of Resource Planning

Master's thesis in Design and Construction Project Management & International Project Management

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Eklund Emma

Gebeyehu Mastewal

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Photo taken by Emma Eklund. Railway tracks in a port in Sweden.
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ABSTRACT

The purpose of this thesis was to investigate and understand the planning processes, systems and actors that are part of railway maintenance projects. In addition, the aim was to identify challenges and success factors for an efficient planning of maintenance activities. The information was gathered through interviews with different actors at a private railway company operating in Sweden. The investigation led to a focus on resources such as personnel, machines, competence and the ability to share knowledge. Factors that affect these resources were identified as; planning, leadership, culture, HR practices and collective approach. These focus areas were analysed through the theoretical lenses of the Resource Based View and Dynamic Capabilities framework, which emphasise on optimising internal resources for the benefit of a competitive advantage.

The dynamic nature of maintenance in railway poses unique challenges in planning, therefore conventional project management techniques become tricky to use. In comparison to construction of new railways, maintenance of railways requires time slots to be approved in advance, which is found to be the main bottleneck when trying to plan long-term. This puts much pressure on the ability to organise internal resources. Since there has not been much emphasis and academic research on cultivating internal resources within the railway industry, this thesis provides some insights to the matter.

Keywords: Railway Maintenance, Planning, Resource Based View, Dynamic Capabilities, Resources, Leadership, Competence, Project Management.

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# Preface

This study is in Project Management in railway maintenance. The study focuses on intangible resources such as leadership, company culture and competence. Interviews were performed at a company operating in the railway industry in Sweden. The information gathered from these interviews was used to understand the planning process and analyse challenges along with success factors in planning. These interviews took place from January to April 2018. The project is carried out at the Department of Architecture and Civil Engineering, Construction Management, Chalmers University of Technology, Sweden.

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Gothenburg June 2018

Cothuru Venkata Mukund
Eklund Emma
Gebeyehu Mastewal

# Notations

| | |
|---|---|
| BAP | In Swedish “Banarbetsplaner”. A type of planning which involves applying for time slots in track 4 to 12 weeks in advance. |
| Bessy | A system in which errors are being reported. |
| BIS | A system which contains maps of the railway tracks and signals, this is used to find the area in which the work would be done and which signals to be locked. |
| BUP | In Swedish “Banunderhållsplan”. A type of planning which involves applying for time slots in track long term in advance - over a year. |
| Catenary | A catenary is a system of overhead wires used to supply electricity to a locomotive, streetcar, or light rail vehicle which is equipped with a pantograph. |
| Client | Swedish Transport Administration. In Swedish “Trafikverket”. |
| Daglig Graf | In English “Daily Graph”. Information given by the Swedish Transport Administration on their official webpage containing graphs/schedules where train schedules are shown. |
| M-Anmärkning | Refers to an error which must be solved within three months of its detection. |
| Materialservice | State owned material delivery service. A main supplier in the case company. |
| Ofelia | A system in which only emergency errors are being reported. |
| Optram | A system for gathering, studying and analysing measurements of tracks and catenaries, as done by a specific measurement machine. |
| OR | The periodic maintenance jobs which form the major contract and are paid for by the client on a timely basis. In Swedish “Oreglerbar Mängd” |
| Power Supply | In the Case Company: Field of maintenance is focused on overhead components with electricity like overhead line equipment and catenary. |
| R- mängd | Non- periodic maintenance job that is done as per the requirements of the rails/tracks and is paid separately as per contract agreement. In Swedish “Reglerbar Mängd”. |
| RBV | Resource Based View. |
| Resources | Elements which are required for the company's production. |
| Signal | In the Case Company: Field of maintenance is focused on the signalling components. |

| | |
|---|---|
| Supervisor | A supervisor directly manages the work activities in the project and oversee a group of technicians to perform these activities. In Swedish "Arbetsledare". |
| T:DOK | Is the standard code set by the government which has to be followed for various activities. |
| Technician | Technically skilled personnel working in the field. In Swedish "Yrkesarbetare". |
| Track | In the Case Company: Field of maintenance is focused on ground components such as rail, sleepers and macadam. |
| V-Anmärkning | Refers to an error which must be solved within 13 days of detection. |
| ÄTA | Extra maintenance orders given by the client during the contract, but paid separately as per contract agreement. In Swedish "Ändrings- ,Tilläggs- och Avgående arbeten". |
| 7/7 shift | Work schedule with one full week working, then one full week off work. |

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# 1 Introduction

## 1.1 Background

The railway maintenance industry in Sweden faces problems in planning for maintenance activities. Complexity in planning is the main problem because there are so many factors influencing the process (Lidén, 2017). Maintenance is defined in the Swedish standard SS-EN 13306 as “the combination of all technical and administrative actions with the aim of retaining or restoring an object in such a condition as to perform its proposed function”. For railways to function safely, all components like railway tracks, signal systems and power supply system, must be maintained regularly. This takes considerable administrative efforts in organizing the manpower, materials and machinery needed to perform the maintenance work. Failure to perform maintenance activities can lead to catastrophic accidents and loss of life and property. Considering the risks, a preventive maintenance strategy is being practiced by the Swedish Transport Administration and its contractors (Al-Douri et al, 2016).

Lidén (2017) explains how railways are different from other transportation modes, considering the tight interdependency between the infrastructure and the trains. However, the work practices and the contracts used are related to construction practices. The Swedish Transport Administration owns the railway infrastructure and is responsible for all maintenance, which they sometimes outsource to private contractors. For any maintenance to be performed, a time-slot on the railway tracks must be applied for and approved by the Swedish Transport Administration, in advance. This situation is non-existent within construction in other industries which signifies the importance of planning in railway projects.

To tackle this complexity in planning, the focus of this thesis lies on understanding the planning process in railway maintenance and finding major bottlenecks within the system. These challenges are related to intangible resources such as, the ability to strategize and lead, competence in planning and having a productive culture. The chosen theoretical framework, Resource based View (RBV), is described by Barney (1991) as focusing on the value of cultivating a company’s own internal resources as a source of competitive advantage.

Railway infrastructure consumes a large volume of resources, so these resources must be used to the maximum of their efficiency. Insufficient planning of maintenance leads to more frequent replacements and further depletion of resources. Maintenance of railways would arguably increase the productivity of the materials thereby reducing consumption, consequently having less impact on the environment (Yuan, 2017; Simionescu & Silvius, 2016).

## 1.2 Aim of study

In this thesis, the Swedish railway maintenance industry will be analysed for the challenges in scheduling and planning of maintenance activities. This thesis highlights the importance of having strategic decisions in resource planning and the key factors that influence resource planning. A focus is given to a specific region in Sweden, however the circumstances surrounding railway maintenance in other regions of Sweden are similar and therefore, the findings of this thesis can be applied for other regions in Sweden. There are three research questions in this thesis. They are as follows:

1. How is resource planning performed in a railway maintenance project in Sweden?
2. Which are the key factors influencing the resource plan?
3. What could be recommended in resource planning for railway maintenance projects?

The Resource Based View was chosen as a theoretical lens to analyse the resources at the case company, and the factors influencing those resources. The RBV framework states that for a company to be competitive in the market, the company must focus on looking internally and develop competences which are vital for its performance (Barney, 1991). The other theory which is being used is the Dynamic Capabilities approach, which states that there should be proper coordination between resources for them to be effective (Newbert, 2007). These two theories relate to one another and are equally important.

In the succeeding chapters, the theory that was chosen is discussed, along with a practical application within a case company specializing in construction and maintenance of railway tracks. An in-depth analysis of the results is presented and possible recommendations are mentioned.

## 1.3 Research Limitations

This research focuses only on one case company working with railway maintenance projects. Findings from this research only show the condition of the case company and recommendations made are also for the case company. The interviewees were all those who supervise the maintenance works and administrative staff were not included in the selection. The research also only focuses on the resource planning in only one maintenance contract.

The processes that were studied are specific to the railway industry of Sweden. So, this might not be applicable in other countries, where the processes surrounding railway maintenance could be different. The scope of discussions is limited to resource planning and other issues that were found during the interviews or observations were considered out of scope for this study.

The researchers had limited time and limited resources while performing the research. If given more resources and time, more in-depth knowledge on the subject could have been achieved. Furthermore, there were a few language barriers between the researchers and the participants in the research. Only one of the researchers was fluent in Swedish, the second researcher was intermediate and the third researcher did not know the language which caused some limitations since some of the participants were not comfortable communicating in English.

# 2 Theoretical Framework

This section presents the basic theoretical frameworks with which the case company under study is viewed. The main set of frameworks in the strategy literature that were selected for discussion in this chapter are the Resource Based View and Dynamic Capabilities framework. Both tend to put more focus on the organization's internal resources' effectiveness and efficiency to derive revenues (Teece et al., 1997). Since RBV and Dynamic Capabilities frameworks focus internally and the aim of the study is to investigate how railway maintenance and internal resource planning can be improved, these approaches are selected as the main theoretical frameworks for the discussions that follow in the succeeding chapters. The issues of knowledge-sharing, trust, motivation, leadership and organizational structure are also presented within this section. The section concludes by highlighting the importance of focusing internally on resources of key competences to ensure efficiency, profitability and competitiveness in the market.

## 2.1 Resource Based View

Strategy plays a key role in an organization. It gives employees a sense of direction when performing tasks with common vision. Nemati et al. (2010) defines strategy as the long-term direction of an organization. The intention behind setting the direction/strategy is achieving a sustained profitability compared with competitors, which is crucial in the field of strategic management (Teece et al., 1997). One research area in strategic management is the Resource Based View, which focuses on cultivating internal resources, for the benefit of creating a sustained competitive advantage(Almarria&Gardiner,2014).

According to Barney (1991) this theory suggests that for companies to achieve a competitive advantage, they need to strategize by making the most use of their internal strengths/resources. The value of resources to a firm's competitive position was first recognized by Edith Penrose, who argues that the manner in which a firm's resources are exploited, determines its growth internally and externally (Newbert, 2007; Penrose, 1959). In the resource based view of the firm there are two basic assumptions (Barney, 1991). The first assumption is that firms within an industry may be heterogeneous when it comes to the strategic resources. Heterogeneous in this context means that each firm have a different set of resources, resulting in different strategies. Secondly these resources may not be perfectly mobile which makes heterogeneity long lasting (Ibid).

### 2.1.1 Definitions of Key Concepts

Daft (1983) defines firm resources as all assets, capabilities, organizational process, firm attributes, information, knowledge, etc. that a firm uses to devise and practicalize its plans to improve its efficiency and effectiveness. These resources can be grouped in to three categories, as per Barney (1991). The first group is the physical capital

resources, which is a firm's physical technology. The second is human capital resources and third organizational capital resources (Ibid).

Barney (1991) describes that a firm is considered to have a competitive advantage when it strategizes its resources to create value in a manner that potential competitors cannot simultaneously copy and implement. It is the ability to create more value to customers in a way other cannot easily reproduce (Almarria & Gardiner, 2014). Similarly, a sustained competitive advantage is ensured when potential competitors are not implementing the same strategy and are also unable to duplicate the fruits of that strategy in some other way (Barney, 1991).

### 2.1.2 Characteristics of resources

Strategic resources that are considered to be the sources of sustained competitive advantage are the ones which possess the following characteristics according to Barney's (1991) VRIO principles:

- Valuable: such resources allow a firm to create value with improved efficiency and effectiveness.
- Rareness: such resources are not possessed by large number of potential competitors of the firm. This will enable a firm to gain a competitive advantage by putting in practice strategies using such resources since they are rare among competing firms.
- Imitability: such resources are very difficult or too costly to be copied by other competing firms;
- Substitutability: it is nearly impossible to replace the value created by such a resource or create the same value using a different resource.

## 2.2 Dynamic Capabilities

In line with Barney's framework there is also another theoretical approach that explains the type of processes by which firms could use their internal resources to gain a sustained competitive advantage (Newbert, 2007). As industry observers remarked in the article by Teece et al. (1997), it is still possible for a company to acquire VRIO resources and still not have many useful competences to survive in the industry. The Dynamic Capabilities framework, as proposed by Teece et al (1997), explains how combinations of resources and expertise, which are difficult to imitate, can be developed to tackle the rapidly changing environment and ensure competitive advantage.

The Dynamic Capabilities framework suggests that profitability in an environment of rapid changes and technological advancements can be insured through perfecting/mastering an organization's own internal technologies, managerial and organizational processes (Teece et al., 1997). The term dynamic is to express the ability of firms to adapt to the fast-changing business environment and devise techniques/competences to create value. Capabilities is referring to adapting,

combining and rearranging all the organizational skills, resources and competences to fit the standards of the changing environment (Ibid).

### 2.2.1 Competences

According to Fiol (1991), organisational competency is a critical competitive resource, which is also fundamentally supported in both the RBV approach and the Dynamic Capability approach. What could be said, however, is that for instance HR systems can be imitable in other companies, and in that way, cause a company to lose their competitive advantage. According to Wright et al. (2001) this argument is hardly relevant since HR practices, including all the interdependencies among the set of practices, which would be impossible to imitate.

People, or employees, could be said to be the key component when addressing core competencies, or capabilities, in an organization. Competence, in a firm's perspective, focuses on collective learning which includes all levels of employees and their functions (Wright et al. 2001). Competence can be shown in the coordination of different production skills, the integration of multiple streams of technology or more specifically "organisational processes, engaged in people, resulting in superior products, and generally these must endure over time as employees flow in, through and out of the firm" (Ibid. p.711). This puts emphasis on how important it is to integrate people management systems into long-term strategy, in order to sustain a competitive advantage. To understand how competence can be developed or maintained, it is crucial to ensure that competence remains, as specific employees leave and new employees must be brought in to replace them. Competences which are associated with the Dynamic Capability approach include skill acquisition, know-how and organisational learning (Teece et al., 1997).

David Teece, said in a public lecture 2016 *"When changing to a dynamic capability approach it is important that more than one individual has the competence within Dynamic Capabilities and the strategic changes that need to occur, also over time, with the mandate to create change."* In the Dynamic Capabilities approach it is vital to ensure that competences are developed to cope with changes over time, in order to stay competitive. Since implementing change in organisational processes, with new necessary networks and behavioural repertoires of employees, is complex and needs new administrative systems, the centrality of HR issues becomes a fundamental strategic contribution (Ibid).

### 2.2.2 Knowledge-sharing

Filieri (2010) stated that the most important source of sustainable advantage has been consistently confirmed as *knowledge and the capacity to create knowledge.* Knowledge can be either tacit or explicit (Hau et al. 2013, Newell, 2009, Nonaka, 1994). Tacit knowledge can be know-how or certain skills, it is the embedded in an individual and is therefore not easily codified or articulated. Explicit knowledge is expressed through easily accessible knowledge such as written documents, reports and manuals.

Sharing tacit knowledge costs significantly more time and effort than sharing explicit knowledge (Hau et al. 2013). Reasons why knowledge sharing is important for organisations include aligning to visions and strategy, group accountability, focus on processes, stronger awareness of customer and competition, collaborative team environment and decentralized decision making but consistent with corporate direction (McNeish & Mann, 2010).

## Trust

Knowledge-sharing is closely linked to trust. Trust as a concept has various interpretations and explanations. In this thesis trust is defined, according to Mayer et al. (1995 p.712) as "*willingness to be vulnerable to the actions of another party based on the expectation that the other will perform a particular act important to the truster, irrespective of the ability to monitor or control the other party*". Knowledge-sharing is important from an individual point of view since they measure their value to the organisation in terms of their ability to interpret the information, as well as the timing of sharing that information (Mcneish & Mann, 2010). Structural implementations in organisations such as contracts, guarantees, social norms, legal and regulatory frameworks can act as antecedents to trust (Mcneish & Mann, 2010). When it comes to control, there are conclusions made that increased control reduces trust (Ibid).

## Motivation

Hung et al. (2011) describe different types of motivation. Intrinsic motivation means that people are driven by a task since they find the task to be enjoyable and they find it inherently interesting, which can also be founded in altruism. Extrinsic motivation is directed towards a specific goal, which could be economic rewards, reputation feedback and reciprocity.

Economic rewards include salary increases, bonuses, job security, or promotions. Reputation feedback is about the possibility for a person to obtain and maintain his or her status within a community by sharing knowledge. Reciprocity is a conditional gain approach, saying that people are only willing to share their information if they can see that is has a personal gain for them (low risk) (Hung et al. 2011). Reciprocity, a deeply held human behavioural trait, is naturally tied to how willing an individual is to contribute to the group, resulting in idea sharing, collective power, output from teams and meeting satisfaction. Interestingly the results of the study from Hung et al. (2011) showed that, without personal commitment, economic reward is only temporarily beneficial for the knowledge sharing and may even later diminish knowledge sharing. Reciprocity does not, according to results in Hung et al. (2011) study, impact the knowledge sharing in general, but has a significant positive effect on meeting satisfaction. Reputation feedback, however, had a big positive effect on knowledge sharing, both considering quality and quantity. Appropriate feedback allows people to understand that sharing

their knowledge helps others, which also increase people's idea of self-worth and peer recognition.

### 2.2.3 Planning

As illustrated by the author Lewis (2011), project management or project planning is generally misunderstood by everyone as project scheduling. But rather scheduling is only a part of the project management. Project management, as quoted by the author, "has two aspects to it; **what** is the task to be performed and the **how** is the process by which it is performed. But process also applies to how the team functions overall- how its members communicate, interact, solve problems, deal with conflict, make decisions, assign work, run meetings, and every other aspect of team performance" (p 9). So, when organisations look at project management or project planning they should look with a mindset. Most of the work in planning is thinking about what you need to do to get everything done, and putting the structure in place to make that happen.

It is very well documented how important planning is. Henry Mintzberg makes a good summary about this in his book "The Rise and Fall of Strategic Planning" (1994). According to the author, planning is important because:

1) Organisations must coordinate their activities,
2) Organisations must plan to ensure that the future is taken into account,
3) Organisations must plan to be "rational" (formalised decision making),
4) Organisations must plan to control.

Long-term planning is a generally seen as an important and necessary part of successful projects. The benefits of planning in this way are greater control and oversight of upcoming work. It is visible when busy or challenging periods in a project are coming up and adequate preparation can be made. It is also possible to track progress, in comparison to the original plan, and update/re-plan activities based on the latest status of a project. Formal detailed planning along with an integration of planning activities is a requirement in most projects (Kerzner & Kerzner, 2013). Integration is necessary to reduce the risk that each unit develops their own planning documents, with little or no regard for other functional units (Ibid). A lack of integration might lead to several consequences such as not aligning to goals, problems when sharing resources and inefficient problem solving.

*"Failing to plan is planning to fail"* (Kerzner & Kerzner, 2013). The future must be taken into account for a project to be successful. Managers often have too much on their mind and as a result, every day issues become prioritised over the long-term preparations. Mintzberg (1994) argues that a plan, at the very least, gives an overview of the items on the agenda, but in best cases and as a means for success is used as a tool for preparing for the inevitable, pre-empting the undesirable and control the controllable. Logically, if a task is uncertain, a larger amount of information has to be processed in order to formulate a plan and make it effective (Kerzner & Kerzner, 2013).

Administering a project and sharing this information enables the managers to constitute shared patterns of thought, which can develop into thinking about patterns instead of only at the specific task itself. Mintzberg (1994) emphasises that the formulating planning itself is powerful since doing so naturally creates and operationalise strategy, so strategic formulation is also strategic planning. He specifies that this also needs to be done well to work, it does not only happen by itself.

Kerzner & Kerzner (2013) points out the need for major milestones, or deliveries at certain times, during a project. If a line manager cannot perform those deliveries, it is important that higher management is involved in the alternatives which can be taken based on this delay, since this becomes a major strategic decision. Besides milestones, it is important with goals or objectives to follow as a measurement of performance and improvement. These goals could be addressed according to the SMART model, meaning each goal must be specific, measurable, attainable, realistic or relevant and tangible or timebound. An objective such as “reduce defects by ten percent” is not enough (Kerzner & Kerzner, 2013).

### 2.2.4 Leadership

Leadership plays a significant role in implementing strategies. Leaders are responsible for giving directions for workers in the organization to perform efficiently in line with the big picture or the organization’s strategies (Jabbar & Hussein, 2017). It is also the responsibility of leaders to motivate their workforce so that strategies and goals can be realized (Ibid). From this it can be easily understood that communication between leaders and subordinates is vital for strategies to be taken seriously and acted upon. In addition, there are other responsibilities of leaders which help a successful strategy implementation. Some of them are, according to Jabbar & Hussein (2017);

- Setting strategic direction
- Setting up balanced organizational controls
- Effectively managing the organization’s resource portfolio
- Creating and sustaining an effective organizational culture

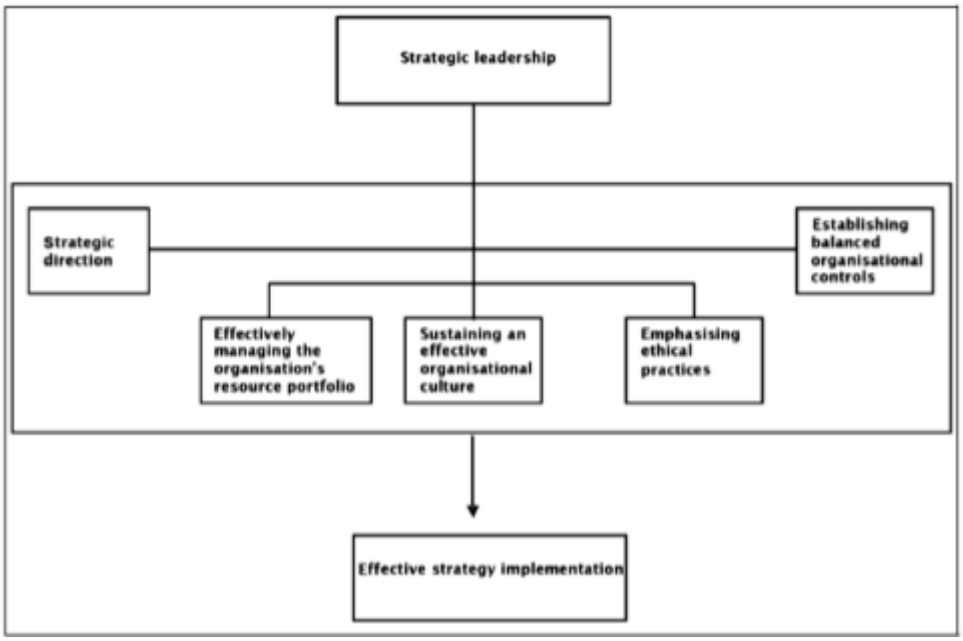



*Figure 1 Leadership responsibilities (Jabbar & Hussein, 2017)*

As leaders try to make organizations more effective it is often noticed that workers continue to work in their old and ineffective ways which could sometimes threaten the survival of the company (Schein, 2010). Getting things done usually involves other groups and working with common goals in which communication with each other is crucial (Ibid). This is also creating a shared meaning to the work that members in the organization are performing.

### 2.2.5 Organisational Structure

Organizational structure is defined as a pattern of arrangement of positions that enhances working relationships among its people to attain organizational goals. It is an antecedent to several significant organizational processes and outcomes (Tolbert & Hall, 2009). The author DeCanio et al. (2000) states that organisational structure affects a firm's behaviour through at least two channels. It directly affects the employees of the organisation or the operating units that comprise the organisation and it also affects the measures of performance such as profitability. The author goes on to state that the external situations such as economic or social situations can go on to produce dynamic adjustments in organisation's internal patterns of communication and connectedness. Along with the organisational structure, the unity of command, principle of accountability, role theory and the classical theory are taken into consideration to construct a proper organisational structure (Rizzo et al., 1970).

The above-mentioned theories are discussed by the author Rizzo et al., (1970), unity of command states that for any action, an employee should receive orders from one superior only. This would avoid situations where the employee is caught in a dilemma between incompatible orders. Principle of single accountability states that a person should be accountable for successful execution of his/her tasks only to one superior.

Such a structure would facilitate the organisation in measurement of progress, consistent reporting and evaluation, and control the work which is to be allotted to the employee. This would also drive the employees in working in a common strategy rather than working on their individual preferences.

The role theory states that when there is a role conflict it induces stress, dissatisfaction and employees' performance is reduced. This results in individual dissatisfaction and reduction in overall organisational performance. The classical theory focuses on tasks, roles and responsibilities being definite for every post that an employee works with. By this, organisations have a better chance in guiding, directing and evaluating their employees (Rizzo et al., 1970).

All the above-mentioned theories help the employee in making decisions. Absence to follow even one of the above-mentioned theories would lead to role ambiguity. Role ambiguity would result in the employee in not realising his/her responsibilities and their Administration in decisions (Wolverton et al., 1999; Rai, 2016). It would contribute to tension, dissatisfaction and propensity to leave (Bedeian & Armenakis, 1981; Rai, 2016). These theories and factors that contribute to the performance of a company should be taken into consideration when an organisational structure is being constructed. A higher priority to these factors is to be given in order for the organisation to have a steady performance and build their internal resources.

### 2.2.6 Culture

Organizational culture is by Brady & Haley (2013) said to be a system of shared identity, which is recognised by its members and distinguishes their organization from other organizations. An organisational culture can show tendencies of being a productive or an unproductive environment. The signs of a productive culture include: seeking and accepting unfavourable feedback, commitment towards continued cultural change and learning, encouraging flexibility towards new policies, rewarding risk-taking, focus on strengthening of trust and cooperation (Argyris, 2010). On the other hand examples of signs that the environment is inhibiting cultural change are: organizations contain organizational defensive routines that inhibit learning and change, lack of appropriate organizational rewards, employees oppose accepting a share of responsibility for the problem by blaming others or the system, people develop a victim mentality that is encouraged by the organization's defensive routines, lack of genuine and enthusiastic commitment by the top management, most top executives lack the time required to be persistent champions for persistent change (Argyris, 2010). The origins for these situations within a firm can presumably be drawn from different aspects of a larger set of organisational norms (Fiol, 1991).

The importance of firm's cultural awareness in relation to the RBV framework is mentioned for instance in Maurer et al. (2011), whom have developed an addition to the RBV, the culturally informed RBV (CRBV) which focuses on culture and how culture

is influencing economical value. Organisations rely on humans in order to create any value and employees are individuals who possess free will which enables them to make decisions regarding the behaviours in which they will engage (Wright et al. 2001). Therefore, the importance of firm culture becomes highly relevant in the RBV approach since it is a core perspective to value when considering organisational change. Fiol (1991) proposes ways of managing culture as a competitive resource and as sustained competitive advantage. The author argues that managing changes in a firm's culture requires incorporating new identities, instead of new behaviours. This enables behaviours found to be tied to specific technical functions and can therefore be understood and mitigated during changing events (Fiol, 1991).

Blomkvist & Hagen (2017) investigated psychological distress in the Swedish construction industry and found that some of the most common stressors in the industry include: tight time schedules, tight budgets, insufficient project planning, high workloads, role ambiguity. The industry also suffers from a lack of experienced personnel, which put pressure on younger employees since they are given a greater responsibility in relation to their competences. This can result in shortages of staff which leads to a more strained psychosocial working climate (Ibid).

From the theories that have been mentioned, it is found that organisations nowadays should cope with key aspects such as leadership, culture, knowledge-sharing, etc, to develop strategies which would improve their competitive advantage.

# 3 Research Method

In this section follows the description, as well as, the motivation of the methodology chosen for this thesis to select the research topic and answer the research questions.

## 3.1 Research strategy

There are three types of logical reasoning forms that are used in every type of research which are induction, deduction and abduction (Flick et al., 2014). These strategies combined with observation form the basis for all researches (Ibid). The chosen research strategy for this thesis work is an abductive research strategy, which means that it constitutes the elements of both inductive and deductive research strategies. This abductive strategy allows flexibility with the research questions and gave the opportunity for empirical data and theory to complement each other.

According to Flick et al. (2014) abduction starts with empirical data without having any theory in mind. Flick et al. (2014) further states that abduction is not a result of unknowledgeable guessing or divine ability to figure out what is right, rather it is all about absorbing the environment and having a meaningful conclusion after interpretation of the absorbed data. This abductive research has begun by observing what the management has already spotted as a problem which was the long and short-term planning. As the project progressed and information added, the focus shifted more from optimizing planning to having a collective approach that would be in place first, so that plans can become much more efficient. This is common in abductive approach where theoretical frameworks are adjusted with the arrival of new insights. The summary of the thesis approach is depicted in the figure below for clarity.

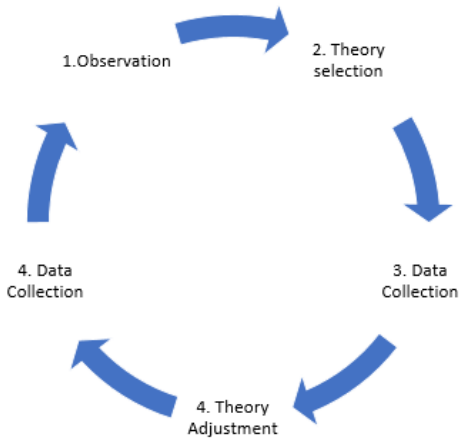



*Figure 2 Abductive research approach summary*

## 3.1. Qualitative Research

The aim of this research is to understand how resource planning is done in the railway maintenance industry, particularly how resource planning is currently performed at the case company. The key factors, for success and challenges, when planning for resources and recommendations in order to improve resource planning in the case company are also investigated. These questions are best addressed using qualitative method. This is because the information and data that were available and gathered throughout the process were of qualitative nature. The analysis was also based on these gathered qualitative data. According to Mason (2002), qualitative research method has an unequalled capacity to constitute compelling arguments about how things work in particular contexts. Creswell (2013) defined Qualitative research as an approach for detailed inquiry and comprehension of the meaning to which individuals or group of individuals relate a social problem/phenomenon.

The steps taken during the course of the thesis project can be generalized with the following diagram, that was adopted from Bryman and Bell (2011), these steps will be further explained in this chapter.

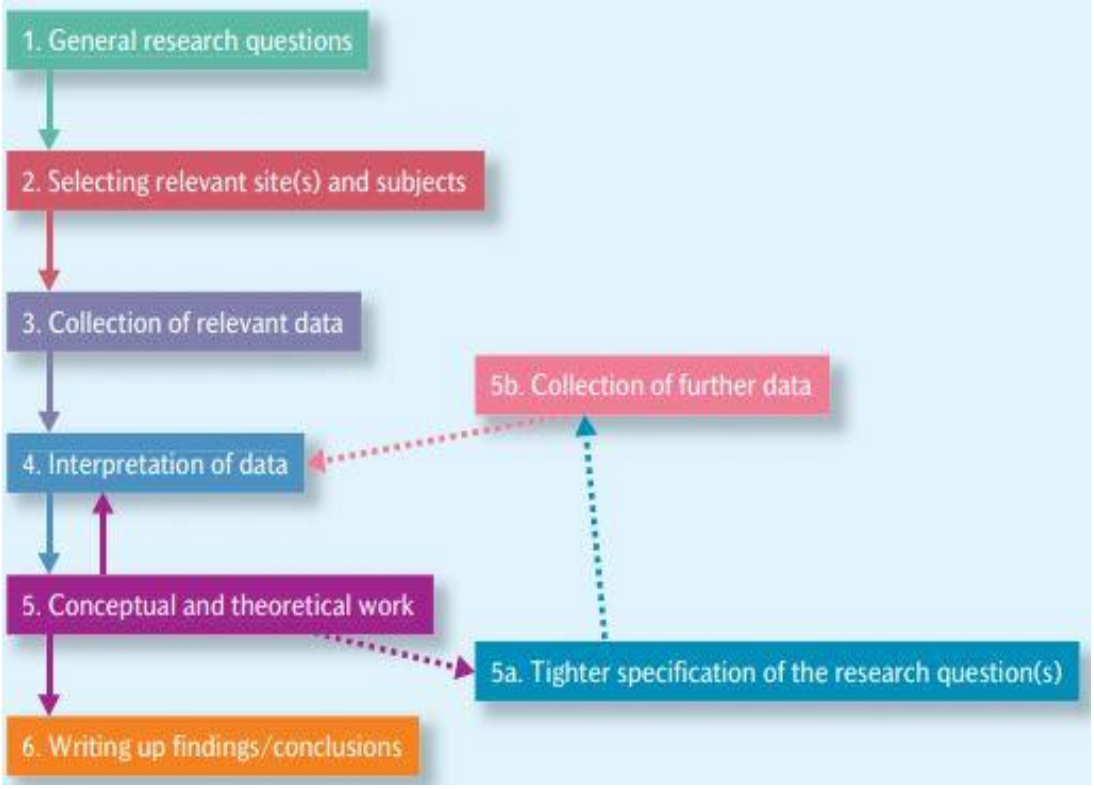



*Figure 3 Steps for thesis project (Bryman & Bell, 2011)*

## 3.2 Research Design

The research formulation was based on the current requirement from the case company, which was also in agreement with our broad research topic interests in our disciplinary area of project management. The research was designed to be limited to a single case company to have an in-depth study of the planning processes and the challenges faced during planning within the case company. The research questions were also designed to address the issues that are specific to the case company. Perspectives from other companies was not collected because of time limitations and specificity of the research questions. Outside perspectives within the company was gained from interviews and conversation with supervisors, technicians and managers, from different contracts within the case company, as well as external agencies.

### 3.2.1 Literature selection

It was found that the Resource Based View and the Dynamic Capabilities theoretical frameworks fit as lenses through which the empirical findings and analysis can be based upon. This is because these theoretical frameworks put the most focus on the internal resources of a company which now the case company is lacking. Since planning of resources consists of issues of knowledge-sharing, culture and leadership it was also found that further literature study in these issues should be emphasized in the theoretical framework.

The literature study was based on several articles and books acquired from Chalmers University library, Google Scholar, and other online libraries. The literature search was made with keywords such as Resource based view, Dynamic Capabilities, Leadership, Culture, Planning, Resource planning, Railway Planning, Maintenance Planning etc.

### 3.2.2 Data Collection methods

This section contains the various sources through which information regarding the processes and challenges were identified. It also contains the methodology used on order to achieve the observations.

**Interviews**

One of the primary sources of information in this research are interviews. Recalling upon 20+ years of experience, Steve Mann claims in his book titled “The research interview: Reflective Practice and Reflexivity in Research Process (2016)”, that interviews are the most frequently used method in qualitative research. This is mainly because interviews are the most natural and suitable way to collect an in-depth data/information required in the research process (Mann, 2016). In addition, it allows participants to express their experiences, viewpoints, beliefs and ideas freely about the research at hand (Ibid).

Depending on the degree of structure for the interviews, Weiss (1994) classifies them into three, namely Structured, Semi-structured and Unstructured. Structured interviews are based on predetermined detailed questions directly to be answered by the interviewee and usually likened as a spoken questionnaire. Semi-structured interviews are those interviews that rely on not a detailed script but a guideline which is to be followed to most part. Lastly unstructured interviews are those which depend on only few open-ended questions which are designed to encourage the interviewee to talk in-depth about the matter in a way he/she thinks is significant (Ibid).

The first qualitative information was retrieved from three unstructured interviews in the beginning of the research. The initial interviews (see Appendix A for interview questions) were performed with three supervisors whom worked in different departments and who have various levels of experience. The aim of the first-round interview was to get familiarized with the works of the supervisors, what they see as most challenging when planning, what they wish was easier etc… The findings from the first round of interviews, that lasted approximately forty minutes each, were very crucial in guiding the direction of the research process. The focus areas of the study were discovered from the first round of interviews. It also led to the selection of the major theoretical frameworks that will be used throughout the research process.

After selecting the major theoretical framework, a second round of semi-structured interviews were conducted. The questions were based on the Resource Based View theoretical framework. Prior to formulating the interview questions, the authors had to put focus on areas crucial to the execution of tasks. To select resources to put focus on, the case company's operations were observed closely resulting in listing the valuable tangible and intangible resources. An input from the first round of interviews was also accounted for in this process. These resources were Material, Machinery, Men, Times in track, Competence and Information sharing. Interview questions, designed in relation to these resources, were intended to understand how the supervisors in all the departments use the listed resources when performing their tasks. In addition, it inquired the various challenges that they face in their work.

The second round of interview questions (see Appendix B for interview questions) were designed intentionally to be semi-structured in order to have a basic guideline but also have follow up questions that would allow the interviewee to elaborate more on the issues that he/she thinks is important. These interviews lasted on average of one hour and were recorded with the consent of the interviewee. The transcription of the interviews was also done directly as the interviews were conducted. This was possible since the research group consists of three members. Some information that was not transcribed due to the speed of the conversation was transcribed later.

The sources for the interviews were first the supervisors at the case company, whom are selected based of the fact that they do all the planning. It is also because they have

the relevant technical and industry knowledge. The site managers were selected in the third round to gain a higher management perspective of the issues under study. All three site managers were interviewed and the average interview time was ninety minutes. The questions (see Appendix C for questions) were mainly focused on the current strategies and goals used in the project.

The plan was to interview all the supervisors in the contract but later in the process it was found that most of the responses from the supervisors were consistent in other words, it got to the saturation point where no added interview gives new information. Therefore, the interview process was finished after interviewing nine of the eleven supervisors. Technician's perspective was also gained through interviews and conversations with technicians of the case company. Outside perspectives within the company was gained from interviews and conversation with supervisors, technicians and managers, from different contracts within the case company, as well as external agencies.

The authors have not sent the interview questions in advance because most of the supervisors are not aware of the English technical/academic terminologies that we used in the questions and it was thought reasonable to translate the questions back to Swedish during the interview so that they feel more comfortable answering. Whereas in the case of interview questions for the site managers, it was decided that the questions shall be sent in advance before the actual interview, for them to prepare and have information ready and also so they are aware of the terminologies used in the questions.

Most of the supervisors that were interviewed can understand the English language but were not comfortable in conducting the whole interview in English. The technique that was used to retrieve most data from these supervisors was to allow them to respond to the interview questions in Swedish and translate what was said to English right after they respond. This gave the supervisors the chance to listen to the translation and validate it. In case of misunderstanding they would explain their responses in a bit more detail, until their response was translated correctly.

### Observations

During the thesis work, the authors were spending the majority of their time in the case company which gave the opportunities to observe and verify the gathered data and also gather further data by observations. Flick et.al (2014; p355) notes that these types of observations allows researchers to directly observe "the many nuances and contingencies to human behaviour" as it occurs naturally. Flick further says that there are different degrees of involvement in observation in a qualitative study, namely peripheral membership, active membership and complete participant (Ibid). Peripheral membership implies less involvement in the observation process while complete participant is to mean that the observer is fully immersed in the environment of those

who are being observed. According to Flick et. al (2014), the later gives the advantage adding own observations as data in to the research. This serves also as a cross-check between observations and the accounts of the observed through interviews in addition to deepening own understanding of the matter. In this research the students have taken a role of a complete membership during observations.

## 3.3 Data analysis

According to Bryman and Bell (2011) one of the major challenges in a qualitative research is that it generates a considerable amount of complicated data, since it relies on sources such as field notes, interview transcripts or documents. The data analysis in this thesis project began with detailed study of the transcriptions. The recordings and transcriptions were filed chronologically and systematically so that it can be retrieved quickly with minimum effort. All the issues raised in the interviews were collected into one spreadsheet document. This allows to see the responses from each interviewee all together and see similarities and differences in their responses.

After sorting and ordering the empirical data, the task of making interpretive sense of the data and constructing arguments becomes easier. The key words from the empirical data were then colour coded and thematised into categories that were then used as a basis for analysis. In addition to the findings from the interviews, the researchers own observation were also used as an input for the analysis process. The themes of the analysis are Culture, Structure, Competence, Leadership, Knowledge-sharing, Planning and Strategy. The selection of themes was based on the grouping of the key words into larger categories which were frequently touched during observations and interviews.

## 3.4 Ethics in research

Prior to conducting the qualitative research by collecting data from interviews, the ethical issues that could arise during the research were addressed. In the beginning of the research, a written permission from the case company to conduct the research was signed by both parties. In addition, it was agreed that the case company will remain anonymous throughout the research and during publication.

According to Wiles (2013), one of the central concepts in ethical research is informed consent, which involves giving the participants in the research a full and clear information regarding the research project and giving them the freedom of choice as to whether to participate or not. During the times of data/information gathering via interviews, the purpose of the study was briefly presented and each interviewee was asked of their wilful consent to record the interview. The participants were also made aware of how the information they give is to be used and reported in the thesis work.

In addition to informed consent, the other ethical issue that was raised was the concept of confidentiality and anonymity. As Wiles (2013) describes it, confidentiality in research is to mean that the information that is collected from the participants will not be presented in a way that it clearly shows the identity of the participants. It also means that some information that were disclosed by the participants will not be reported without the wilful consent of the source of that information (Ibid). During collecting the information for the thesis work, it was mentioned for the interviewees/participants that their responses is going to be used in the text as anonymous. Due care was given during the production of the texts to keep the confidentiality agreements and guidelines. In addition, every effort was made during writing to assure that the responses that the interviewees give will in no way be used against them and that their responses are only used in the thesis work.

## 3.5 Research Validity and Reliability

According to the book "*Essentials of Research Design and Methodology"* by. Marczyk et al. (2005), validity is the term that is used in all kinds of research to explain the conceptual and scientific soundness of a given study. It is a key concept in research, essential to increase the accuracy of its findings (Ibid). Marczyk et. al (2005) suggest that there are four distinct types of validity; these are internal validity, external validity, construct validity and statistical conclusion validity. The nature of the research is qualitative and there was no statistical data gathered or analysed.

As per Marczyk et al.'s (2005) explanations, internal validity is the ability of the research to eliminate other explanations to the results. This is achieved through interviews with all those who have a direct relationship with the production and therefore knowledgeable about issues discussed. External validity is a term which refers to the degree to which the final findings of a given research can be generalized to other conditions, participants, places etc…(Ibid). The authors choose to interview all of the supervisors in the contract in order to gain all the views and information so that the findings and analysis can be used to some extent in other similar contracts as well. Supervisors exist in all railway projects in Sweden and have similar work tasks, therefore another study could be performed at another project with the same method. The contract, however, is a larger contract in the country, which could give implications when trying the same method on a small-scale project.

Construct validity relates to the harmony between the results of the research study and the theoretical frameworks that were used to guide the research. The results from the research go in agreement with the suggestions of the theoretical framework of cultivating competitive advantages form within the company.

In this thesis, the researchers spent four to five days a week for four months at the case company's office, which allowed them to cautiously observe and understand how

the case company performs. This, as a result, helped in the reliable interpretation of elements in the observation. A meeting with the supervisor at the case company was also conducted reporting the findings from the interviews and observation, which resulted in a positive feedback regarding the objective accuracy of the findings.

## 3.6 Work division

It can be concluded that the authors of this thesis work have contributed equally for the success of the research. All the authors had fully participated in all of the research processes like interviews, discussions, observations and meetings with both the case company's thesis supervisor and supervisor at Chalmers. There were also division of works between the authors so that the work can proceed with speed and efficiency.

Cothuru Venkata Mukund, was responsible for participating in the interviews with follow up questions during interviews that were mainly in English. He also took part in the writing of most of the introduction chapter and the case background.

Eklund Emma, author who was also employed by the case company, had the role of booking interviews with the supervisors and site managers and conducting the interviews which mainly required the Swedish language and translating it so that the other participants can understand and ask follow-up questions. She was also responsible for transcribing interviews that were held in Swedish.

Gebeyehu Mastewal, was responsible for participating in and transcribing the interviews which were held in English. He took part in writing and documenting most of the weekly thesis activities and discussions that were held between the authors. He was also responsible in the writing of most of the Method chapter.

All the authors took part in writing of the theoretical framework, empirical findings, analysis and conclusion. All the authors were also responsible for reading through each other's individual works and making corrections through comments.

# 4 Case Background

The case company is an international private railway company who specializes in railway infrastructure, railway vehicles and mobility systems. It is a leading private company in railway maintenance & construction and mostly works in project-based contracts. They have a strong focus on safety, reliability and being proactive.

The case company has several projects across Sweden. These projects have clients from both the private and public sectors. They also have a diverse range of competence in carrying out a variety of works related to railways. The company has competence both in construction and maintenance of railways. It has won several public contracts in both areas. This thesis is only regarding maintenance works of railways, not construction. The case company has maintenance contracts in major cities in Sweden. The chosen contract is one of the larger contracts in Sweden, which is in the proximity of a major city in Sweden. The contract is based over a five-year period and covers all railway maintenance in the specific area. Since many of the contracts in Sweden have strong similarities and since the processes are also under the same influences throughout country, the findings of this thesis could be used for other regions as well.

The case company has hold the past maintenance contract in the same region, and in the fall last year, 2017, a new contract was again won, renewing it for the next five years. It is important for the case company to have this larger contract in the region, so that a base is established and several other smaller projects around the region can be executed with the existing resources. These additional projects will generate extra revenue, since they have a history of generating extra profits. Furthermore, the extra projects will consequently reduce overhead costs.

Maintenance on the railways in the case company is often done manually with hand held tools and sometimes together with the help of machines. The machines used are manually or semi-manually operated, unlike the fully autonomous machines in the production industry (Wilson et al., 2007). Due to the railway industry's dependence on manual labour, careful planning is required. Men, as a resource, are more complex when compared to materials or machines. Each person possesses different skills in variating levels and they do not come with a manual, unlike machines and materials. This complexity and dependency of the skill set makes it difficult to plan or coordinate (Clydesdale, 2013).

Railway transportation is different from other transportation modes such as shipping, air and road traffic due to the tight interdependency between infrastructure and trains. Since the railway system has this level of interdependence, the utilization of the tracks must be closely monitored in accordance to safety. The Swedish Transport Administration, regulates all access to the tracks, whether it is a train or maintenance

works (Swedish Transport Administration, 2017). The access to the tracks is decided through negotiations between Swedish Transport Administration, train operators and contractors. The process of applying and getting the times approved is based on skill, knowledge of systems and the rules & regulations within the industry, as well as client requirements. For this reason, “times in track” is considered to be a resource, since it must be acquired. The “times in track” literally means times in track. To perform any type of maintenance, times in track must be approved before execution. The railway contractors apply for time slots on the tracks for either maintenance or new construction of railway through one of the processes BAP, BUP or service windows.

## 4.1 BAP and BUP

BAP is a longer time slot on the tracks, for large scale works. The plan for all the following year’s BAP time slots is decided at least one year in advance. The plan is fixed. BUP is a shorter time slot, which can be applied for four to twelve weeks in advance to a maintenance work’s execution. Both BAP and BUP plans concentrate on a specific area, as requested by the contractor and approved by the Swedish Transport Administration. This area is determined between specific signals or points of reference in the blueprints of the tracks. Those blueprints can be found in the BIS system.

## 4.2 Service windows

The last type of times in track is the service windows. According to Lidén & Joborn (2017) service windows are time slots varying between 2-6 hours and are being allotted by the infrastructure manager before the timetables for trains are constructed. The authors also say that service windows are dimensioned and constructed before the procurement of the maintenance contracts. This is done to facilitate the service company in estimating expenses before the price for the quotation is being made.

The main objective of the service windows is to increase efficiency, reduce costs and planning burden and improve robustness and punctuality (Lidén & Joborn, 2017). Since the service windows are decided and set in advance, it would help the maintenance contractor to streamline their work and facilitate them in reducing the time for applying for times in track. Integrating these service windows in the timetable is a complex procedure, the window patterns should be designed in a way that maintenance activities and train operation is coordinated in a well-balanced manner, which is non-trivial (Lidén et al, 2018).

## 4.3 Types of Work

Maintenance works are, based on their nature, classified into five categories of work. The types are as follows:

- OR
- ÄTA
- R-mängd
- Ofelia
- Bessy- V & M

OR are types of maintenance works that are predetermined and should be performed at specified regular intervals around the year. The intervals may vary from every month to once a year. The works that are classified as OR are, for instance, inspections of the railway tracks and facilities, switch maintenance and snow clearance. Bigger works such as replacements of tracks, switches, overhead cables, signals, tongue rail, etc, fall into the category of R-mängd. Smaller works, which are additional to the original contract, but must be performed within a timeframe, is categorised as ÄTA. Some of these works are already included in the contract, but most of these works come additionally in the form of orders from Swedish Transport Administration throughout the year. Upon execution of ÄTA and R-mängd, the case company gets paid extra apart from the contractual money, based on negotiations between Swedish Transport Administration and the case company.

Ofelia are maintenance works in the form of errors, which are urgent and require immediate attention due to their high importance for safety. Usually when components break or develop a crack, it falls under the Ofelia category. These works are naturally of high priority in the project organisation. The case company is supposed to attend to them at the earliest time. For instance, there is a fifteen minutes' deadline to reach an error at the central area in the city. The time required to attend to the Ofelia is set by Swedish Transport Administration, based on the location of the Ofelia from the case company's office. Fines will be incurred to the case company in case they fail to attend to Ofelia on time.

Bessy are potential errors that have been found upon inspection of tracks, components and anything disruptive of train transport. There are inspection teams of both Swedish Transport Administration and the case company who physically go around the tracks looking for errors and there are types of inspection trains which are travelling over tracks and finding errors by measuring discrepancies. Once the errors are found they are being reported into a system called Bessy. Based on the nature of the error it will be categorised into either V or M. V Bessy means that the error is supposed to be rectified within thirteen days and M Bessy means it can be rectified within three months from the date of inspection.

## 4.4 Supporting IT systems

Railways, being a complex environment with unpredictable situations for maintenance, makes planning complicated. The areas are often large, changing over time and require different types of maintenance and expertise depending on the condition of the tracks, weather and traffic frequency. Optram is a system for gathering, studying and analysing measurements of tracks and catenaries, as done by a specific measurement machine. This data reveals the condition of the tracks generally which can beneficially be used to plan for maintenance activities (Swedish Transport Administration, 2017). These models can be developed with the help of IT technology, considering the complex calculations involved. The models can then be optimised and developed based on the data that could be collected with the maintenance activities that are carried out (Guler, 2013). Some examples for the supporting systems used around the world are Shinkansen Management Information System (SMIS) by Japanese Railways (JR), Bovenbouw Informatie en Contoie per Onderhoudsectie (BINCO) by the Dutch Railways, Maintenance and Renewal Planning Aid System (Mini-MARPAS) by the British Railway (Ibid).

# 5 Empirical Findings

This chapter contains the findings from the interviews and observations at the case company. The section 5.1 will answer research question 1, how resource planning is currently being performed in a railway maintenance project in Sweden. The following section 5.2 would address the challenges and success factors that influence the resource planning of the case company. Section 5.3 and 5.4 summarizes all the challenges and success factors that were found.

**Project overview**

All the site managers have similar views on what the case company's goals and vision are. They stated that the case project aims to be "the best project" in the railway maintenance industry in Sweden. In addition, the company has other goals like environmental goals of reducing carbon emissions, having a positive economic result, having a lean tool for their warehousing and being able to pass the requirements of the safety laws and regulations when audited.

## 5.1 Resource planning in the Case Company

The following section will explain how the resource planning is currently being performed in a railway maintenance project in Sweden as per research question one. The information below is based on the answers from interviews with supervisors and site managers at the case company. The preliminary set of interviews with supervisors helped in identifying major resources that the company need, to execute maintenance activities.

Resource planning is now totally performed by the supervisors. Each supervisor has been allotted different areas of tracks to work in, which they are responsible for all the works within. Errors are given the highest priority. For the supervisors to make a resource plan, first and foremost the important resource is the times in track, which must be applied for and be approved by the client. Supervisors also plan for material, machines and personnel. The figure below shows the deadline until execution before which resources should be planned for.

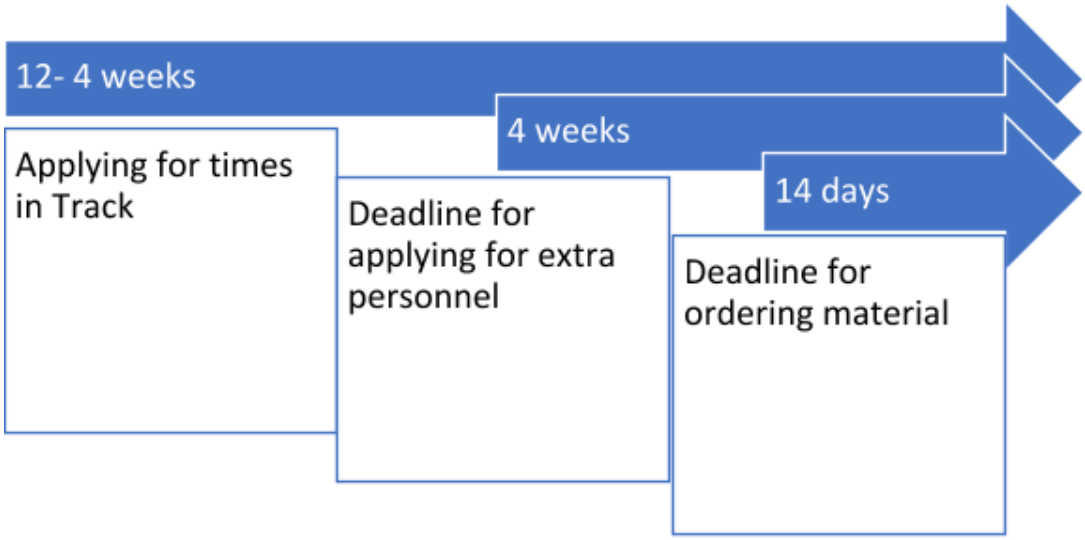



*Figure 4 Deadline for resource planning*

### 5.1.1 Times in Track

Railway projects differs from other construction projects' execution in the way that a contractor must apply for the time slots in advance, to perform the tasks allocated. Independent whether those times are BAP-times, Service Windows or BUP-times, all times must be applied for within the BUP-time slot window i.e. 4 to 12 weeks before planned execution of the works. Service Windows are at a supervisor's disposal, and are being used to some extent. Service Windows is a new way of working in this contract. All supervisors use BUP-times. Few supervisors use BAP-times, besides from the power supply department which mostly use BAP-times.

The time slots are being facilitated and distributed by Swedish Transport Administration, who in this project, is the sole client. Each supervisor approximates the time required for a specific task and decide when to both perform and apply for the time slot, based on their personal knowledge and preferences. The supervisor will then, at a certain point, send information to the BUP and BAP personnel, who administer the application to the Swedish Transport Administration. The process can be seen in the figure 5 All types of work need to go through this process, except for emergency errors, "Ofelia", which can be directly performed for safety reasons.

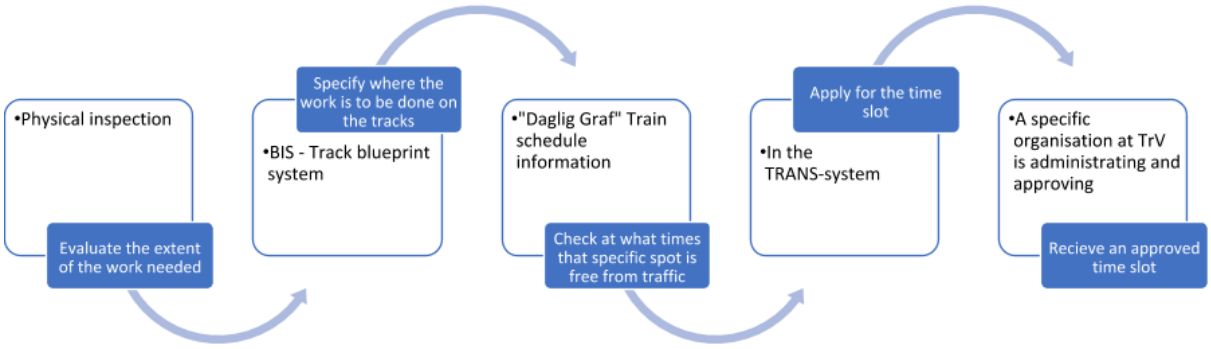
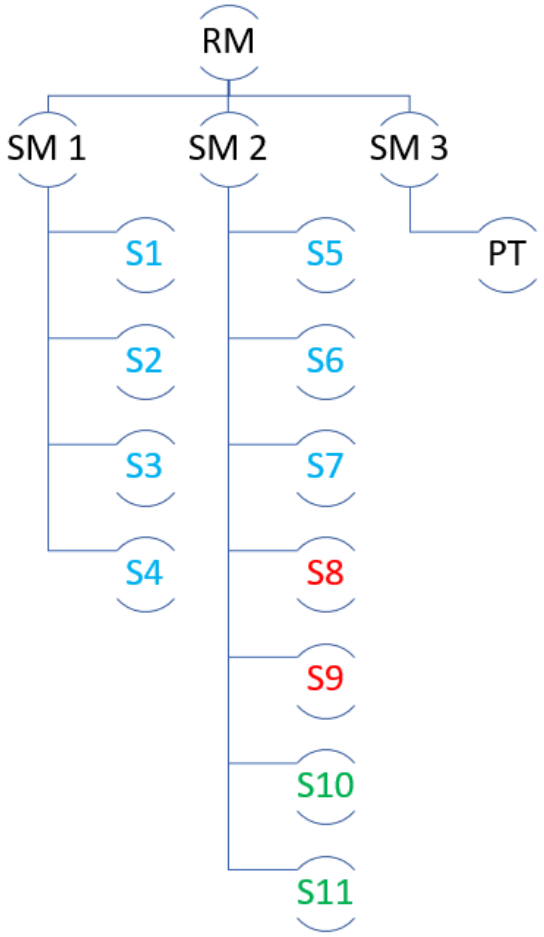



*Figure 5 Times in track application process*

### Personnel, Machines and Material

5.1.2 The case company's production staff consists of 3 site managers, 11 supervisors and 70 technicians. The organizational structure for production is shown in the figure below.




**Key**
RM- Regional Manager
SM- Site Manager
S- Supervisor
PT- Planning Team
Blue- Track Department
Red- Power Supply Department
Green- Signal Department

*Figure 6 Organisational Structure for Production*

The production is divided into three main areas: Track, Power Supply and Signal. The major work is done in the Track Department. There are two supervisors working in the Signal Department, two supervisors in the Power Supply Department and seven supervisors in the Track Department.

The supervisor plans their technicians differently. One supervisor, for instance, plans according to a cost calculation, as the supervisor puts it “I have a specific budget to a specific job. Based on that budget, I estimate the number of personnel and type of machine which will not go over budget”, whereas another supervisor initially makes a schedule for his personnel and then makes a plan. There are a fixed number of specific shifts, which are predetermined and negotiated with the union. Any changes in the shifts must be announced two weeks prior to the execution of the tasks. This is however flexible depending on the relationship between the supervisor and the technician and what the prospects for overtime pay is for the technician.

Machines are generally being allocated after the times in track is approved from the client. Not all maintenance works require machines such as tractor or a crane, which are commonly used in R-mängd works. The project has a long lease for 5 heavy railway specific machines, one example is the VG90 which is used for many of the major maintenance works. There is only one technician who has the competence to operate the VG90. The way in which they are booked or planned is unstructured and verbal. There are machines which are being hired from external contractors, by the supervisors, based on their connections and experience. The supervisor has the liberty to choose the subcontractor. The case company has its own national machine pool, with some specific heavy machines which readily available for booking.

The case company is obligated to use only one supplier for railway materials, Materialservice, which is operated by the Swedish Transport Administration. This obligation is a result of a contractual agreement. Based on different types of materials, the delivery time varies. The deadline for ordering material is 14 days prior to the planned delivery date. The supervisors oversee the ordering of all materials. Tools and materials such as gloves or hammers, which is not railway specific, are ordered in the market.

### 5.1.3 Competence

The work that is being performed in this contract requires a high level of competence. This however is not easy to achieve, since the availability of the competence in the market is low and it takes a lot of time and money to train people to achieve the required competence. The project hires external personnel when there is a need for specific competence, whenever an increase in production or deficit of personnel is occurring. The Power Supply Department consists of 50 % internal personnel and 50% externally hired personnel since a long time. Two of the supervisors are externally hired long-term. The short-term hiring can be anything from one shift to one month. Supervisors use sub-contractors based on their own experience and know-how. They are not told

to use any specific strategy for using them. The efficiency of the internal technicians is low but still technicians from outside are being hired regularly. Supervisors would like to use their own suppliers since they believe that they are more reliable. When asked about this, the reply was that its best to use their contacts.

Some of the supervisors are experienced working in an office environment, while others are inexperienced. They all have a strong technical background, since they are former technicians. The competence for technicians in performing works in the field varies a lot and when there is a lack, which happens for all the supervisors, the supervisors must share resources among each other. All bigger component changes require some signal technicians, but the work is being performed by a track supervisor and track technicians mainly. When a supervisor lacks a certain competence within his team to perform a task, he/she verbally asks another supervisor to borrow the technician with the required competence. The signal department is often asked at a late moment to lend out technicians, one signal supervisor for instance said, “I know that my staff will be stolen, so for me to be able to finish my regular maintenance, I will add some extra personnel in the planning so I won't have to postpone my production”.

When the technicians go on training, which they go often, the supervisors must substitute the technicians to maintain their daily production plan. One signal supervisor said in an interview “I try to plan for an 80/20 attendance rate to compensate for absence due to training” which means that, the supervisor plans for only 80% of the available time and leaves 20% as a buffer for training the technicians. No other supervisor had the same technique, instead they plan for trainings when needed directly in relation to their own production. When technicians go for trainings, supervisors often have a demand for local knowledge when in need for extra personnel, which is hired externally.

## 5.2 Challenges and success factors

This section will address the challenges and success factors regarding resource planning, as stated by the site managers and supervisors in the interviews. To structure those findings, main challenges have been identified and categorized into the subjects of Planning, Leadership, Culture, HR practises and Collective Approach.

### Planning

5.2.1

*Challenge of timely approval of times in track:* One of the common complaint that almost every supervisor had was that the times in track that they apply for, gets approved at a late stage. Further they state that, sometimes the times get approved the very same day that the work was planned to be executed. This, however, leaves no time for the supervisors to find some other work, increase the times in track gets cancelled, resulting in a loss of efficiency of personnel, idle machines and longer storage of materials.

*Challenge of mismatch between work duration and times in track:* Mismatch between the approved time slots and the actual duration of time required to complete the planned maintenance job is also a hindrance when it comes to planning. Supervisors might plan for manpower, machine and materials but the client might approve a time-slot not long enough to complete the entire work, which results in re-planning of the whole maintenance job. This problem is being dealt by splitting the work into two and performing it at two different time slots. Since the work is split into two shifts, the costs incurred is increased. In addition, late approval or denial of the requested time slots gives supervisors an added challenge due to uncertainty.

*Challenge of scheduling of personnel with matching times in track:* A major challenge faced by all the supervisors is the mismatch between the time slots approved in the tracks by the client and the union approved schedules for maintenance workers. Longer time slots are given for works during the weekends which are hard to utilize since the current staffs are not scheduled for long hour weekends. During such common incidents supervisors are forced to hire workers from external companies. This external hiring is usually viewed as normal by supervisors even though it costs a lot more. Considering the financial situation of the company, the management is now having talks with the union to change the schedules and have more time in the weekends when times in track is available.

*Challenge in planning for right competence:* During the interviews, one of the major challenges that almost all the interviewees faced when planning, was the issue of *lack of competence*. Supervisors told that there are competences which are very important but very rare. These personnel with the special competences in all the departments are not many in number and usually must work from supervisor to supervisor as per the requirements of each supervisor's work at the moment. The major challenge is that supervisors will plan for a maintenance job that requires these special competences

and at the same time another supervisor encounters an emergency maintenance job requiring the same competence. In these cases, the emergency is given priority and the other job will be delayed. To solve this problem, supervisors hire these rare competences from external consultants at a higher price, both long-term and short-term. It was mentioned by one of the interviewees that external consultants/technicians are paid ten hour shifts even though the time-slot approved is only four hours which creates even more financial burden.

Another example in planning for right competence, as described by one of the interviewees, is that there are some technical works that the supervisor has not received any training for. It was mentioned that such lack of competence will have an adverse effect on the planning for the production. In addition, during seasons like Spring, supervisors mention that maintenance works are too many and the workforce and competence available is much less than required. One reason for this is the lack of technicians with local knowledge of the railway tracks in the region. The tracks in this specific region are, in their configuration, different from railways in other parts of Sweden. Supervisors, along with a site manager, said technicians with the local knowledge will help speed up the maintenance work and add to the efficiency of the work. One site manager believes that the competence within the company is indeed enough but it is not being used efficiently in the production; “I think we have enough personnel in the company, but since they do not have a strategy for how to position them, they are using the competences inefficiently. A new goal could be: The right competence at the right place!”. The other two site managers were not knowledgeable regarding competence within this specific contract.

*Challenge of lack of common visual tool:* Most of the supervisors find it difficult to plan to use the information from Bessy, BIS, Optram, Daglig Graf. Since all these systems are not visual and that none of them have easy features that would allow each supervisor to see what the other supervisors in the contract are doing or planning to do on a specific date. In addition, these systems are not updated regularly so that information gathered from one system must be cross-checked by another system for accuracy.

*Success factor:*

i. A good practice that was mentioned by one power supply supervisor was having the inspection personnel within his team, instead of outside his team. These personnel will report their inspections regularly. He explains that this makes him anticipate most of the errors and upcoming maintenance jobs so that he can prepare with the required manpower, material and machines in advance.
ii. The Optram system is not being used for predictions of the needed future maintenance of tracks at the case company currently. There is a maintenance engineer which is appointed to work with analysing this data. This is highly beneficial for anticipating future maintenance works and avoiding sudden failures.

## Leadership

5.2.2 *Challenge of lack of alignment to common goal:* What the supervisors have in common is that they perform their work in the way they wish to do it. This is because they have not been told by the managers to perform them in a specific way. Aligning the supervisors towards the project goal is tough since the supervisor's work differently. A common strategy for planning of activities is not been given by the site managers to the supervisors. Supervisors are only allotted their area of work and finding the work in their allotted area is left to themselves. Some supervisors figure it out from the contract document and some figure it out from the site managers and some extract information from tools such as Bessy. This makes it necessary for the supervisors to have a very good knowledge of the contract to not miss any details.

*Challenge in lack of targets from higher management:* The company is currently undergoing major change efforts. There is a strong focus on improving the efficiency of production and site managers are highly involved in these processes. There are, however, no measurable targets given to the supervisors for them to achieve or improve upon. People just keep working in a way that they like. This makes it difficult for the managers to assess supervisors on their performance or the supervisors to look at a scale for improvement in their performance.

*Challenge of role ambiguity:* The site managers are found to be the leaders of the project. There are 3 different site managers with varying experiences in the field of railway maintenance. The main challenge is that there is no unified way of working among the site managers. There are some boundaries in the work they perform, but often those lines are blurred. The site managers lack role descriptions and the responsibility between the site managers is not clear. Some supervisors claimed that sometimes the site managers are found to neglect a work thinking this should be done by another site manager. Supervisors are faced with ambiguity because they receive orders from all the three site managers. One power supply supervisor said, "I discovered recently that I was supposed to do some job but no one told me, I found that out during a meeting with the client and felt quite embarrassed."

*Challenge of lack of acknowledgements:* One conversation with a technician at the case company revealed that the *rewards for knowledge sharing are slim*. He explained that he had seen a need for a specific type of railway component at another department and that he had an effective solution to solve the need in that department. This solution involved him giving that department some of his departments stock. After helping them solve the issue he asked for them to order back the items taken, but this was never done. He now says that he tries to avoid sharing his knowledge with other departments since this happened and press that these situations often occur when others share.

*Challenge of initiating long-term plan:* Site managers are found to agree upon the need in the project to have a long-term plan. But at the same time, steps to implement the long-term plan are slowly being taken, because of the current immediate issues that should be fixed. One of the site manager started to form a planning team, which had the sole purpose of making a long-term plan. But the team is scattered and are not working on it. Managers have the drive to change things in the project and make it better, but the implementation phase of the change is not made. One of the site manager has some ideas and experience in long-term planning but he was not found to be a part of the Planning Team.

*Success factor:* During the interviews with the site managers it was found that the problems faced by the supervisors were acknowledged by the managers. This shows that the managers are aware of the problems in the project and are working towards rectifying them. During the thesis from January to May, there was so many changes that were happening inside the project which shows that managers are taking efforts to improve the situation. But the impact of the changes has not yet been ripened.

5.2.3

### Culture

*Challenge in meeting culture:* There is a strong meeting culture in the project. There are regular meetings happening around the week for specific reasons. From the observations of the authors it was found that there were no discussions happening in the meeting but rather only information display. Managers ask for few answers but the people attending the meeting are silent and manager takes silence as approval to move to further topics of the meetings. The meetings are mostly about current issues and how to solve them. But there were no meetings done to talk about future events or problems or how to avoid them.

*Challenge of the pace of the organisation:* The environment is for the production usually coloured by a fast pace with swift sharing of information, along with many phone calls and a strong will to solve occurring problems. There is also encouragement of risk-taking and autonomy from site managers to supervisors which can be seen as a positive aspect. The staff is regularly moving around from office to office to discuss with colleagues and get help solving issues. People ask each other in the corridor

whether they have seen another colleague and where to find them. Discussions and meetings are often interrupted by other, more urgent, issues. There is a strong focus on the *now*, rather than the future.

*Challenge in lack of diversity*: The need for technical expertise to supervise the technicians has resulted in a homogenous group of supervisors. All have similar backgrounds, are Swedish and taught in the same way from a technical background, most often with little or no influence from other industries or cultures. There is, however, often a long background with working in projects in other parts of Sweden prior to becoming a supervisor.

*Success factor:* The coffee break culture is healthy and people seem to discuss topics outside their work. They forget the work pressure for the 15 minutes and talk generally. When people go back to their work they are more refreshed and they can concentrate better. Sometimes the coffee break is also used for sharing of information or resources between them. It is also observed that during the breaks the supervisors, managers and administrative people all sit together which increases their accessibility.

### 5.2.4 HR Practises

*Challenge in lack of trainings for supervisors:* Even though trainings are one of the ways with which competence of supervisors is cultivated for gaining competitive advantages, it is among the least focused upon areas in the case company.

*i. Training in Planning:* When answering the question “have you undergone any training in planning in your role as a supervisor?” most supervisors reacted similarly. They all had an attitude which seems like they are not getting the attention they need from their management considering development or even basic skills. Every supervisor answered no to this question, some with a laugh and others with a bitter facial expression. Often at the case company there is this notion that coming to that office means that you get a chair and a computer and you just “go”. There is little, if any, introduction and people just must learn by teaching themselves.

*ii. Training in supporting systems:* All the supervisors said that they don’t have any training in support systems. They are self-taught in Microsoft Excel, which is the system they use when it comes to planning of their activities. Bessy, Mobigo, T:Dok, Optram, Trafikbilder, Daglig Graf, Navision and BIS were other supporting systems that were mentioned during the interview. Some supervisors tend to use only one of the above-mentioned systems in addition to Excel whereas others use more than one system to get information. The supervisors got most of their knowledge on how to use these systems from their experience.

*Challenge of finding/retaining competence:* A phone interview with a construction manager, from a project within the same company in Stockholm, revealed that the main

reasons why highly skilled employees decide to join the case company is because of job stability. There is a deficit of highly skilled personnel, mostly in higher competences in power supply and signal on the market. These highly skilled workers most often get recruited, after their technical studies at certain schools are completed, from smaller consultancies around Sweden because they offer benefits and high salaries. In these times, it is very hard for the case company to be competitive since they cannot offer the same salaries. Furthermore, it is risky for the case company to themselves train personnel since they then often get recruited by the same companies. The Construction Manager in Stockholm has a long experience of trying to make the union agree to contracts which means that a technician who has undergone certain training must remain within the company until this training has been "paid back" or if they leave the company they will have to pay back a percentage of the training in relation to the time worked. This has unfortunately been declined multiple years over time. The reason why they have most of their staff is due to the job security which they can offer. Working for the consultancies means a lot of money, but also uncertain working hours and locations all over Sweden. This creates trouble usually for their personal life and is more often suited for younger, unattached workers.

*Challenge of high turnover:* The case company suffers from a high turnover in staff. A challenge pointed out by supervisors was, former bad planning of activities, which were passed on to them by previous supervisors. It was mentioned that since activities need to be planned at least months in advance in railways, former bad plans will tend to roll into the future and disrupt the works in the present. For these reasons activities are being postponed or cancelled. During the interviews, supervisors mentioned that technicians are required to acquire new competences or renew their current competences through trainings in their expertise. The challenge is that it is difficult to find replacements when technicians leave for trainings. Now there is no overall plan for replacing staff during training in the case company during their absence.

*Success Factor:* One of the administrative personnel in the case company has compiled a list of competences in the industry and the education required to achieve the competence. This work is in progress to define specific competencies and facilitate competence development. Now, no such document/guideline exist which would define the competencies and help the company in knowing what to do, in order to develop a specific competence.

## Collective Approach

The findings from the interviews made it clear, that the maintenance work that is being performed by the case company is interdependent between the 3 departments. However, supervisors work independently and this causes difficulties in sharing of resources. This section is therefore named “Collective Approach” to highlight challenges is a result of this discrepancy.

5.2.5

*Challenge of not using Service Windows:* Supervisors during the interview stated that “*I do not use service windows at all because it is just extra administration for me*”. Furthermore, service windows are a new concept that has been used by the case company since September 2017. The Service Window plan need to be defined by the case company at least a year in advance for the following year. If this is not defined, a general outline will be used, independent of the time needed. Some supervisors state that the service windows are too short to perform any work within it.

*Challenge of finding information regarding available resources:* To facilitate resource sharing the management has provided the supervisor with a medium to share resources. An employee was hired for the sole purpose of resource sharing both internally and externally. Meetings are conducted every week where supervisors come up with their requirements of resources. The resource planner takes a note of the requirements and tries to fix it. This was however found ineffective since the resource planner said that it difficult to look for resources internally since the availability of internally resources was ambiguous. Some supervisors gladly share their information, whereas others are very restricted sharing information. So, when there was a need of resources, the planner would generally go externally to other parts of the company or other agencies.

*Challenge of hiring machines:* Site managers stated that supervisors need to hire machines from the machine pool before external hiring. They stated that prices are lower for renting machines from the internal machine pool but there are cases where transportation of that machine from other parts of Sweden to the region becomes very expensive and leads to extra costs for the case company. The case company has a system where all suppliers for machine and materials who have a contract with the case company are listed, since this system is not updated regularly, it creates confusion among planners, which leads to supervisors hiring machines from suppliers whom they have good work relations with, regardless of prices for instance one track supervisor said “It is more important for me to ensure that the driver/operator is good, than the price for the machine is low. In the end it will cost more if the driver is inefficient. so I don’t use the list, I choose the ones I know are best.” All site managers acknowledge the lack of strategy regarding how to hire, from whom to hire and when to hire machines.

*Success factor:* All supervisors were clearly devoted to the safety aspect regarding railway maintenance works. The work environment is very dangerous and the technicians face high risks in a daily basis. Furthermore, any negligence to the maintenance performed could result in loss of life and property. This strong common attitude in the organisation has led to safety naturally being the company's main goal.

## 5.3 Summary of challenges & Success Factors

The interviews and the observations revealed various challenges and success factors that supervisors and site managers are facing, when it comes to their resource planning and daily production. These have been grouped into five main categories and are summarized here in the table 1 and 2 below.

| **Category** | **Various Challenges** |
|---|---|
| Planning | ● *Challenge of mismatch between work duration and times in track*<br>● *Challenge of lack of common visual tool*<br>● *Challenge in planning for right competence*<br>● *Challenge of timely approval of times in track*<br>● *Challenge of scheduling of personnel with matching times in track* |
| Leadership | ● *Challenge of initiating long-term plan*<br>● *Challenge of role ambiguity*<br>● *Challenge of lack of alignment to common goal*<br>● *Challenge in lack of targets from higher management*<br>● *Challenge of lack of acknowledgements* |
| Culture | ● *Challenge in meeting culture*<br>● *Challenge of the pace of the organisation*<br>● *Challenge in lack of diversity* |
| HR practices | ● *Challenge of finding/retaining competence*<br>● *Challenge of high turnover*<br>● *Challenge in lack of trainings for supervisors* |
| Collective approach | ● *Challenge of hiring machines*<br>● *Challenge of finding information regarding available resources*<br>● *Challenge of not using service windows* |

*Table 1 Summary of Challenges*

| **Category** | **Various Success factors** |
|---|---|
| Planning | *Inspection teams within department and Optram usage* |
| Leadership | *Problem acknowledgement* |
| Culture | *Coffee break culture* |
| HR practices | *Guideline for competence and its education, Job stability* |
| Common Goal | *Strong Safety Culture* |

*Table 2 Summary of Success Factors*

# 6 Analysis & Discussion

In this section, research question two *"Which are the key factors influencing the resource plan?"* and research question three *"What could be recommended in resource planning for railway maintenance projects?"* are answered. The key factors are being analysed through the established theoretical framework and recommendations are being suggested when possible. The answer to research question 1, "How is resource planning being performed in a railway maintenance project in Sweden?", was explained in the Empirical Findings section. However, this section further develops the findings through an analysis, resulting in in-depth knowledge, adding to an overview of how maintenance is done in Sweden for railways, which is something that has been lacking to some extent in the literature found.

The theoretical frameworks used in this thesis work suggest that for a company to become competitive and sustain that competitiveness, a company must consider developing its internal resources and capabilities (Barney,1991; Teece et.al, 1997; Newbert, 2007). Findings from our interviews and observations suggest that resources and capabilities are not given the deserved attention i.e., resources and capabilities are not being exploited within the company in a way that they generate sustained economic advantages. This can be seen from the fact that supervisors chose unnecessarily external hiring and there seems to be no plan in the near future to overcome this challenge.

## 6.1 Planning

Lewis (2011) states that project management or project planning is generally misunderstood by everyone as project scheduling. During the interviews, with the supervisor and the manager, when asked about how planning is being done, they start to explain on how the maintenance works are scheduled by the supervisors. This shows us that personnel in the case company have also misunderstood project management or planning with scheduling. Rather the managers should be aware of the processes through which these works are being performed. For example, communication, decision making, problem solving, running meetings, etc, as mentioned in the theory.

Since the long-term plan is not being performed by the case company, they have been hiring external personnel at very short notice repeatedly. The availability of this external personnel at the last moment is not certain thus the case company can run into a situation where the work could be cancelled due to the unavailability of personnel both internal and external. This could be overcome by having a long-term plan where supervisors could predict in advance the necessity of special competences. This increases the control over activities as suggested in the book of Mintzberg (1994). This is the same case when it comes to the booking of machines. Supervisors are found to look for machines at the last moment and there is no proper plan in booking it. In cases

when it is not available, it is being booked externally which costs more for the case company.

One other issue that the supervisors face is lack in competence required in technicians to perform the maintenance works. Supervisors always are looking for extra personnel with a specific competence and they feel that they do not possess enough. But the site managers feel that the competence is generally available within the company but it is not used effectively. So, this comes down to the point that there has not been proper coordination between organisational processes as suggested by Mintzberg (1994).

The client is responsible for accepting the application for the case company's times in track. Since the times is track often are shortened and/or cancelled at a very late stage, the supervisors intentionally do not plan in long-term, since the fear that the times will be cancelled. Furthermore, even though the supervisors indeed apply for the times as far in advance as possible, there is still a history of times in track being approved or declined very close to the execution of the task. Instead of a longer-term plan, they have staff ready to perform at a short notice. This should, consequently, result in inefficiencies in workers time and the stress laid on other parties. According to Mcneish & Mann (2010), structural implementations in organisations, such as contracts and guarantees or legal and regulatory frameworks, can act as antecedents to trust these could be in place to avoid this situation.

When analysing the challenge of scheduling personnel with matching times in track, it can be said that the management is keen in changing its schedules for the technicians. This however goes in contrast to the challenge of finding/retaining competence, where job stability is one of the major assets for the company. So, if the management is concentrating on changing schedules, then it could lead to a situation where employees may find less job stability in their work and as a result this leads to higher turnover. Rather the company should concentrate more on increasing its times in track during the weekdays and develop a strategy in hiring for external personnel for the weekends.

Trust, as defined by Meyer et al. (1995), referred to the willingness to be vulnerable to the actions of another party. There were some found issues based on trust in the case company. One supervisor for instance did not trust the other supervisors to ask for resources in advance. The supervisor set standards that to be able to plan longer-term, the technicians will need to be available at that time. The problem is that the supervisor's technicians get "stolen" from other supervisors at a late stage, which means re-planning the work, consequently violating the set standards by management and colleagues. In the end the supervisor, instead of trusting colleagues, builds buffers in plans to ensure that staff will be available. According to Mcneish & Mann, 2010, the timely sharing of information helps in improving trust between colleagues. This however, is hard to bring about since the entire process of planning must change, for

this to happen. This then falls under the responsibility of the management in changing the process, thereby resulting in higher trust between colleagues.

**Recommendations**

Optram is one of the systems which is available today for long-term prediction of the condition of the tracks. From the findings, it can be said that the company has personnel working in it. This system however gives benefits for the company in long-term. Considering the long-term benefits and financial situation of the company now, the company has risks of not concentrating in Optram since it does not give immediate benefits. So, it is highly recommended that proper resources should be given to analyse and develop the usage of Optram, consequently incorporating the results with the long-term plan.

Integration between functional units is of high importance, as suggested by Kerzner (2013). As in this case it was found that the inspection team and the error correction team were not coordinating but rather functioning independently in case of Tracks department. Whereas in the Power Supply department both the teams were under the same group. The supervisor from the Power Supply suggested that, this made it easier in predicting what work is to come and plan for it in advance. The same strategy can be used for the Track department as well. This helps the Track department in reducing the uncertainty and making the plan more effective in performance.

## 6.2 Leadership

Leadership competence and leadership style that fits the nature of the industry and the organization is one asset in the organization that could also be considered as one of the crucial resources that the case company can use to gain competitive advantages in the market (Teece & Linden, 2017). It can be seen from the findings that the leadership in the case company acknowledges the challenges that supervisors are going through and is making some changes to improve the situation. Leadership plays a vital role in implementing strategies (Jabbar & Hussein, 2017) that would alleviate the challenges faced currently.

As suggested by Kerzner (2013) decision-taking is one of the most important jobs for a manager. These decisions affect the overall execution of the project. In the case of this company it was found that new orders were being given from the client and the managers have been accepting it. But since there is no long-term plan, there is no proper medium through which the managers can compare and make a decision to accept, or decline, the orders. Since there is a high workload, the case company is therefore at risk of being in a situation where they might not be able to execute the accepted extra works. If accepted extra works are not executed, this might result in penalties from the client.

From all the interviews with the supervisors at the case company it can be concluded that the supervisors perform what they want individually, rather than aligning to a common strategy. After the site manager interviews it was clear that supervisors do so because there are no clear strategies about how and what work to perform, that are being followed in the company. Setting strategic direction or goals in an organization is one of the major responsibilities of leadership according to Jabbar & Hussein, (2017). Suggested strategies are only ideas at the moment. Mintzberg (1996) suggests that forming a plan itself becomes the means create and operationalize strategies. Since there is only scheduling, and little, if any, planning taking place the opportunity of Mintzberg's suggestion is not being taken. Because the site managers are the only employees which have the overview of the production in the project the responsibility lies on them to formulate a plan, consequently leading to creating solid strategies for the case company.

Kerzner (2013) says that having a long-term plan is important and a necessity to have a successful project. The author further says that this provides control and oversight of the upcoming work. From the site manager interviews it was found that all the managers are very much accepting the fact that having a long-term plan is of high importance. For the purpose of having a long-term plan, the case company has formed a planning team, which would be in charge of formulating the long-term plan. Formalising this long-term plan also requires a special competence in coordination of different organisational process (Wright et al., 2001). The planning team is then supposed to have this coordination competence of different processes, but now the

team is small and highly limited both considering coordination of processes and their current workload. One site manager is responsible for the planning team and since strategies can be formed through applying planning, it is important for the site manager to be in control of the development of the long-term planning so that the new strategies can be transferred to the other site managers.

Milestones and deliverables are important for a project (Kerzner, 2013). One of the advantages is the ability to measure the performance of the company and make improvements if needed. Since there are no milestones or deliverables set by the case company it is difficult to reflect upon the project progress. Having proper milestones and deliverables could help the case company in measuring the output, for example showing cancelled Times in Track by the client. This could be a way of getting additional Times in Track from the client. But without a proper medium to compare, it is difficult to argue with the client. Both Kerzner (2013) and Mintzberg (1994) suggest that having a long-term plan helps in checking progress and having better control.

As DeCanio et al (2000) stated, Structured Organization affects the firm's behaviour either through the employees' or work-units or the firm's performance. Interviews and observations at the case company revealed that it is difficult to know which supervisor is doing what, implying a lack of clear structure and role divisions, which has resulted in a lowered performance. This is also in accordance to the role theory stated in Rizzo et al (1970) which says that unclear role descriptions which usually lead to role conflicts result in dissatisfaction and reduced performance. The site managers should preferably define the roles and responsibilities to avoid this reduced performance.

It is the job of the management/leadership to effectively manage the company's resource portfolio (Jabbar & Hussein, 2017). Portfolio meaning having clear guidelines on how resources can be used, shared and hired, which is specified from management. However, it can be observed that supervisors are the ones in control of the management of the resources, not the site managers. Supervisors use, share and hire resources as per their preferences and they are not following any common strategy in their decision making. The site managers acknowledged in the interviews the lack of a resource portfolio. Supervisors therefore could be making cost inefficient and biased decisions which do not align with the company's goal of reaching a positive result. It furthermore complicates the decision-making process for new supervisors since they lack official guidance over, for instance, which suppliers to use and when. This lack of a resource portfolio how to use it shows a gap in leadership that should be bridged.

Supervisors have a high workload and tend to focus on their administrative and scheduling tasks. Since supervisors are busy with their work and won't have time to acknowledge the good performances of their workers, it is found to be demotivating for technicians to work creatively and transfer their knowledge to others. The same

tendency is also present between site managers and supervisors. The theory from Hung et al. (2011), concerning reputation feedback, could in this case be applicable. The story about the machine operator being negative to share knowledge, tells us that if the technician would have received some form of gratitude he would feel confident in sharing knowledge at other times. When it comes to the fact this information was not reciprocated from the other department, this could be due to the current culture in the company and will be addressed in that specific chapter. Reputation feedback is proven to be an efficient way of enabling knowledge sharing, both considering quality and quantity (Hung et al. 2011).

The managers have not emphasized enough or taken steps to motivate the supervisors to do a long-term plan. That could be done by creating and sustaining a culture in the organization (Jabbar & Hussein, 2017) which encourages thinking ahead of time and planning long-term. However, supervisors feel that BAP timings will be cancelled by the Swedish Transport Administration and there is no use in planning for it in advance. Managers say that since the supervisors have not applied for it they do not have an evidence to talk with the Swedish Transport Administration on the issues of times in track getting cancelled.

**Recommendation:**
A first step for the case company can be to acknowledge which types of motivation that drive each supervisor. Some supervisors might be intrinsically motivated by finding resource sharing to be enjoyable and interesting. Some supervisors do engage in the weekly meeting and openly show their availability of their personnel. Altruism can also intrinsically motivate certain supervisors to share information, which is a strong asset for the case company to have in these individuals and therefore identifying and nourishing these assets are beneficial for the case company.

## 6.3 Culture

A company's culture is naturally very hard to imitate and is strongly influencing the productivity of a company. In accordance to Argyris (2010), the culture at the case company shows tendencies towards both a productive and unproductive environment. There is an encouragement of risk-taking and autonomy from site managers to supervisors, which can strengthen the supervisors sense of ownership of their tasks. There is a lot of verbal and unstructured information-sharing taking place which can signify an open sharing environment. Evidently, there is also the issue that supervisors only work according to their own experience and do not conform to other, more common, ways of working. There is also a defensive attitude of "I do what I want to do" which signifies a lack of interest in learning to work in other ways.

The importance of culture, according to the CRBV framework, is described in Mauer et al. (2011). Since, according to them, culture is influencing economical value the

current unproductive culture can be one of the reasons why the case company's branch is currently not profitable. Fiol (1991) proposes ways of managing culture as a competitive resource and as sustained competitive advantage by incorporating new identities, instead of new behaviours which enables behaviours found to be tied to specific technical functions and can therefore be understood and mitigated during changing events. This enables any misconduct to be referred to a role, rather than a person. Under the leadership theory section of this thesis, the importance of role descriptions and risks of role ambiguity was mentioned, which consequently also influence the culture and therefore should be treated with importance. The roles are now not specifically defined and there are also a new planning group, whose role in relation to the supervisors have not been defined. If this remain to be the case, there can be implications on changing the culture from being unproductive to productive.

Argyris (2010) mentions other signs of an unproductive environment such as the lack of organizational rewards, which seems to be not present. Additionally, supervisors seem often to refer to a victim mentality in an unproductive environment. This can be related to the finding in which supervisors felt that they had not received any training in planning from senior management. Lastly another sign which Argyris (2010) mentioned was that most top executives lack the time required to be persistent champions for persistent change. Considering the high workload for all site managers, absence of one site manager and all site managers being new in their role there is very little time over for their staff and to be able to create persistent change.

The weekly production meeting address different issues and are mostly focussed on site managers giving information to the supervisors regarding all matters related to production. The resource sharing forum during the same meeting does not efficiently facilitate a sharing of resources. The meetings in the case company were found to be very one-sided, with site managers giving information and supervisors not engaging much. The reason could be that they do not feel that the information they give will be beneficial for them personally. This motivation is defined by Hung et al. (2011) as reciprocity which is naturally tied to how willing an individual is to contribute to the group, resulting in level of idea sharing, collective power, output from teams and meeting satisfaction. Therefore, the site management must in meetings contexts put emphasis on what the supervisors can gain personally from sharing information in the meetings, and not only the collective benefits.

Blomkvist & Hagen's (2017) findings regarding psychological distress in the Swedish construction industry matches the environment in the case company clearly regarding the tight budgets, insufficient project planning, high workloads and role ambiguity. Role ambiguity also increasing stress as described by (Rizzo et al., 1970). Blomkvist & Hagen's (2017) further point out that the industry also suffers from a lack of experienced personnel, which put pressure on younger employees since they are given a greater responsibility in relation to their competences. This could be a reason

why there is a high turnover in staff, as Blomkvist & Hagen (2017) pointed out, leading to a more strained psychosocial working climate. Many of the supervisors are young and only have experience from being technicians, not leaders or managers.

## 6.4 HR Practices

The Resource Based View theory (Barney, 1991) and Dynamic Capabilities (Teece, 1997) suggest that for a company to attain a competitive advantage, it needs to develop its internal resources. This is further supported by Fiol (1991) who says that organisational competence is a competitive resource. In the case of competence, it is a valuable resource since competence is not available in the external market easily for railways in Sweden. From the interviews it was found that developing the competence requires a lot of time, effort and money. Added to it there is a wide variety of competence which is required to perform the activities in railway maintenance. These factors make it important to develop competencies inside the company to attain a competitive advantage.

To sustain competitive advantage Teece et. al (1997) suggest that combinations of resources and expertise shall be developed within the company. However, it can be observed that the case company is going against this strategy by external hiring which will cultivate the competences of externally leased workers. As external workers become more and more experienced it will cost the case company more and more since prices rise with experience. If competences and experiences were developed within the company it would have costed the case company a lot less.

Wright et al. (2001) says that competence lies in all the levels of the organisation. But the competence is different based on the work that he\she performs. For example, in the case company the technicians require a technical competence in performing the maintenance works whereas the supervisors require technical competence in understanding the work, planning competence and managerial competence to handle the technicians. It was found that trainings are given only given to the technicians for performing their work on site whereas there was no training given to the supervisors in performing managerial or planning tasks. Rather the supervisors working today are just technicians who got promoted.

It was found that there were personnel who were leaving the company but steps must be taken to ensure that the competence possessed by the person leaving the company stays inside the organisation. Otherwise it becomes very difficult for the company to replace them.

The lack in competence with the supervisors in planning can be seen through examples such as, supervisors apply for times in track without checking how much time is available but rather apply for how much they would like to have, so the request

gets rejected since the availability of the time is shorter than they asked for. This just delays the process and makes unnecessary conversations between the company and the client.

At the case company, information is mostly shared tacitly. When transferring knowledge this becomes more time-consuming and effort demanding than explicit knowledge sharing (Hau et al.2013). This can pose as challenging during needs of intensive knowledge sharing, such as introduction for a new employee. The swift given information, with the technical jargon at the case company complicates it even further for new employees. Here is the value of making knowledge explicit and accessible for employees of utmost importance. As described by Newell (2009) written documents, reports and manuals can help in sharing knowledge.

Job stability is one success factor identified during a phone interview with a construction manager in Stockholm. The case company should therefore make strategic decisions to keep this factor to their advantage and target employees who are looking for job stability. However, as can be understood from observations, the case company is trying to make changes and negotiations with the union so that workers could work during the weekends, where the time slots are the longest at the moment. This imposes a risk that most of the highly skilled workers in the company leave for other competitive companies for a higher pay since they are forced to work the weekends. Therefore, the case company is recommended to not force the change of schedules, instead it should have negotiations with the client to have longer time slots during the weekdays when the workers are on duty.

## 6.5 Collective Approach

Having a collective approach to working is helpful when coordinating between different functional units. From the article of Kerzner (2013) it is found that having an integration is very necessary due to the risk that each unit develops their own plan can disrupt the other functional units. The supervisors are planning on their own and from the interviews of signal and power supply department it was found that technicians are being shared at the last moment. This proves that there has been no proper integration in the plans of the different functional units. Rather the supervisors are thinking about the work they possess and its completion without considering the disruption of plans of other supervisors.

As defined by Nemati et. al (2010) strategy is the long-term direction of an organization which gives employees a sense of direction to perform their tasks with common vision. The interview with the supervisors at the case company revealed that supervisors plan and perform individually. Most of the supervisors tend to do their planning based on their past experiences and personal preferences. Site managers also lack strategy in place to give a sense of direction for the work of all the supervisors, which is crucial for sustained competitiveness and efficiency according to Teece et. al (1997).

One principle in the Dynamic Capabilities states that, all resources i.e., physical, human and organizational capital are coordinated in a certain manner so that resources can be used in a way that is difficult to imitate by competitors (Teece et. al, 1997). The way that the resources/information are being shared is therefore of high importance in establishing a competitive advantage. Since the supervisors must coordinate information/resources regularly, doing this efficiently is crucial. However, it has been revealed during the interviews that supervisors lack a well organised system for information and resource sharing. Machines are being ordered by supervisors based on experience. In addition, even though there is a list of suppliers who signed contract with the case company, since it is not timely updated, it is difficult to consider the list as an accurate list of suppliers. There is lack of general strategy when it comes to how, when and where to hire machines. This also adds to the problem of information sharing regarding availability of already leased machines. All the mentioned challenges emerge from lack of common approach within the organization. Resource sharing today is quite inefficient and therefore it is recommended to acknowledge this and take measures to improve it.

According to Lidén and Joborn (2017), Service Windows are time slots which are being allocated in the time table for the sole purpose of performing maintenance activities. Considering this being a new concept that the case company has been working with from September 2017, steps must be taken to utilise the windows effectively. Supervisors feel that the service windows are small and are not suitable for performing any work in it. In such a situation, if it found to be true, then the management has the responsibility in taking this situation to the client so that the same windows are not being carried over for the next year. The collective approach of the company should be in the direction that time slots, such as service windows and BAP, are being used to the maximum extent to perform the maintenance activities and reduce the usage of uncertain BUP timings.

## 6.6 Recommendations

Research question 3, "*What could be recommended in resource planning for railway maintenance projects?*" is further developed by finding the interdependencies between multiple areas. Site managers pointed out the need for coordination of organisational processes, which goes hand in hand with the Dynamic Capabilities approach. It became clear after analysing the findings that there is a need in multiple areas, such as leadership, planning, HR practices, of coordination. There are many interdependencies which could be addressed, but some important interdepencies are being highlighted in this section.

From the analysis, the two major aspects, leadership and planning, are found to be very much interdependent. It is the responsibility of higher management in initiating the long-term plan. However, it is not enough if the management just initiates a plan and outsources it to the planning team, but rather be involved in the process of planning

and check whether the plan aligns with the project goals. Similarly, for the higher management to control the project they would require a long-term plan, which acts as a measurement medium to compare and takes steps in their progress.

An example where the leadership and collective approach goes hand in hand is with service windows and BAP times. The case company now faces difficulties in the utilisation of service windows, as said by the supervisors, since they have a short duration or no work can be performed in the specific location. In such a case, it is up to management in taking up this situation with the client, so that the Service Windows are longer and placed in areas where the need will come up.

Planning for technical competence was a challenge in the planning section of this thesis. Another challenge addressed the lack in HR practices in finding and retaining competences. These two are clearly connected in the way that if there is no process or function towards competence development, the future need for specific competences will be hard to fulfil. This responsibility is now at the hand of production personnel, which has little time or knowledge of competence development. They may have some specific knowledge, but still lack the overall picture of the project and future competence needs. It is therefore recommended that a central HR unit, with the HR knowledge and competence required are responsible for the competence development.

Hiring external competences which have a high technical level, as in the Power Supply Department, directly contradicts the RBV and Dynamic Capability approach of cultivating your internal resources. This could be corrected by the management's role of having a resource portfolio, where the specific competences are defined based on their internal importance. Higher competences could for instance only be allowed to be used internally within the case company and more available resources could be outsourced.

As per Dynamic Capabilities approach, for the company to have better coordination between its key competences and become competitive in the industry, there shall be a common understanding that each employee must play his/her own parts/roles efficiently. This will happen when employees know what their roles and responsibilities are and train for executing it properly. This is the sole responsibility of the site management at the case company today and they have not done this so far. Maybe an HR function, externally or internally depending on the available competence, would more successfully define the roles and responsibilities of each employee.

The meeting culture within the case company indicates that supervisors see no use in sharing information which facilitates resource sharing. This can be connected to leadership since it should be the management’s responsibility to incentivise the information sharing sessions. These incentives could include reciprocity as mentioned earlier and therefore create a positive awareness within the supervisors so that they become more open and cooperative with each other.

Connecting different areas with each other points out how clearly interdependent they are, and how important it is to be aware of this interdependence when implementing change. It is therefore strongly recommended that the case company know how each

area influences another before a specific change is considered.

## 6.7 Sustainability aspect

An aspect which has not been mentioned, but is of great importance, is that of sustainability. Railway transport, when considering both goods and travellers, is an environment friendly means of transportation, in comparison to most other transportation modes. By working with the RBV and Dynamic Capability approaches in railway projects, the improvement of internal processes would arguably also improve the quality of the maintenance. Better maintenance of railways means better everyday lives for commuters and more efficient transportation. Better maintenance also means better safety in the form of less accidents, when travelling on those tracks. More planning in performing the activities on the tracks will also allow technicians to be more prepared for the jobs to come, and therefore be able to take the safety measures needed in beforehand, resulting in a safer work environment.

The long-term gain for improved maintenance work on railways could result in more reliability of train schedules and maybe even lessened costs for travellers. This would be an incentive for traveller to take the train instead of driving a car, which would mean a societal benefit from a carbon footprint perspective. Long-term planning would also enable the case company to have a better overview of the future works, resulting in the possibility to cooperate with other major projects/companies in the area. This cooperation can optimize the maintenance which coincide with other projects and make the noise pollution from maintenance works close to people's homes less frequent.

Tracks which are well maintained will enable trains travelling on those tracks consume less energy, in comparison to poorly maintained tracks. Finally, one last point concerning the benefits of better railway maintenance could be that less costs can generate more profits, resulting in the possibility of more investments in infrastructure in general.

# 7 Conclusion & Further Research

## 7.1 Conclusion

In this thesis an assessment of resource planning in a railway maintenance project in Sweden has been done, through the theoretical lenses of both the RBV and Dynamic Capabilities frameworks. This assessment firstly included mapping of the processes, systems and actors which are a part of a railway maintenance project. Secondly, the assessment included a presentation of the RBV and Dynamic Capabilities frameworks, along with relevant theory such as planning and leadership. Lastly, the assessment bridged theory and the empirical findings with an in-depth analysis. Major lessons learned throughout the course of this interesting project under each area that were identified as sources of competitive advantage have also been summarized.

From the first research question, “How is resource planning performed in a railway maintenance project in Sweden?”, it was found that railway maintenance differs from other construction, such as the construction of buildings. The bottleneck of needing times in track, before the execution of works, complicates projects in the railway field. In addition, it was found difficult to determine one common way in which all the supervisors do their planning since all staff performed it differently from each other. There was also no planning, but scheduling only, being done, so there is a clear requisite for implementing planning processes.

The second research question “Which are the key factors influencing the resource plan?” helped in identifying key resources that the case company need to plan and coordinate. The key resources include Personnel, Machines and Material, Times in Track, Competence and Knowledge-sharing. Furthermore, key factors that influence the resources were also identified; Planning, Leadership, Culture, HR practices and Collective approach.

Finally, the third research question “What could be recommended in resource planning for railway maintenance projects?” is answered with a recommendation that each of the key factors are interdependent of each other. A change in one area will also affect other factors and it is recommended that the case company work on all the aspects simultaneously. It can be pointed out that a strong interdependence exists between leadership and planning, therefore, it is the responsibility of the higher management to partake in planning long-term.

## 7.3 Further Research

During the master thesis, there were areas which have been identified that require further research. These areas, which were considered important, are being discussed below.

It was found that railway maintenance project in Sweden uses the general contracts of the construction industry. However, the nature of the railway industry is different compared to that of construction. So, it is recommended to develop contract forms which would suit the need of the railway maintenance industry.

Works in the railway maintenance project include works that are known well in advance and works that come up at the very last moment. This requires a special type of project management practise which combines ad-hoc and long-term planning. Now, not much research is done combining them both in the railway industry.

The importance of intangible resources, such as leadership, culture, are soft areas that generally are overlooked. There has not been much emphasize in research about these aspects in the railway industry. It would be interesting to research the role of intangible aspects in the railway industry and this paper could be a reference for future research.

The research about usage of BIM in the construction industry is ongoing and actual. During the thesis, it was found that the railway maintenance project required a visual tool which could aid them in planning of their activities. Therefore, it could be said that the practical applications of BIM could be further extended to the railway industry as well. However, research could be suggested which could result in developing a process to effectively utilise BIM in the maintenance projects.

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# 9 Appendix

### Appendix A - Initial interviews

Interview question for preliminary interview with supervisors are as follows:

1. What are the different types of activities (field work) that you do, and what categorizes do they belong to? OR, R-mängd, ÄTA, Ofelia and Anmärkningar. (examples)
2. How do you get information on activities, which and when you should perform?
    a. Who is doing the long-term planning (8 to 12 months in advance) in your department?
    b. Which tools do you use for planning of OR/ÄTA activities?
3. If you, for some reason, could not execute your activities, what would be the main cause\causes?
4. What types of jobs do you prioritise and why?
5. What sort of assistance would you appreciate from people at the office?

## Appendix B - Supervisors interview questions

Interview question for interview with supervisors are as follows:

Part I. Introduction

1. What is your role in the company? Could you explain it?

Part II. Details

1. How do you plan your personnel for your tasks?
    a. What challenges do you face when you plan for your personal? 2. What challenges do you face when planning for materials and machinery?
    b. How do you make sure that the machines and materials on site are available when it's time for the work (have you faced any conflicts with booking, has another supervisor used the machines that you should have?)
2. How do you plan for materials and machinery that you need for activities?
    a. How do you apply for times in track?
    b. What challenges do you face when you apply for times in track?
        i. do you face schedule conflicts and how do you work with it?
        ii. Time gap is not enough?
        iii. If your work is cancelled (times in tracks, weather etc) close to execution what do you do with the planned resources? (Is there a plan B?)
3. Are there opportunities to work together with other supervisors and how do you know about it? (ex. Do you have access to other supervisor's plans?)
4. Has a strategy from your senior management been given on how to do the resource plan?
    a. Influence of client or site manager on prioritising, conflicts, coordination of works
5. How can your organisation support you in these tasks?
    a. Did you undergo any training for planning before you started as a supervisor?
    b. What type of supporting systems would you like to have for resource planning
    c. What type of supporting documents (underlag) do you have at your disposal for your work tasks. How do you know when to plan for the execution of your tasks?

Part III. Extra if Possible

1. Are your YA (technicians) ok with working according to your times in tracks or do you have conflicts with it? (reframe) How do you deal with this issue (with a proper introduction)
2. How do you evaluate the risk of a work being cancelled due to the working environment (Weather, client involvement - extra activities, managers etc)?
3. Is there anything going really well in your work. Do you have any suggestions for improvement?

## Appendix C - Site Manager interview questions

Interview questions for site manager interviews are as follows:

Introduction

What is your role in the company?

Main interview

1. What is the strategy regarding using machines as a resource in the organisation?
    a. What challenges do you see regarding machines and how do you address them?
2. What is the strategy regarding ordering and storing material?
    a. What challenges do you see regarding material and how do you address them?
3. What is the strategy regarding personnel as a resource?
    a. What challenges do you see regarding men and how do you address them?
4. What is the strategy regarding times in tracks?
    a. What challenges do you see regarding times in track and how do you address them?
5. How do you ensure that these strategies are informed to the supervisors?
6. Is training in resource planning required for the supervisors? Why?
7. In what way is work being accepted and also allotted to the supervisors?